DOCUMENT RESUME

ED 383 247 HE 028 359

TITLE	Interactive Video Program. Final Report and Recommendations.
INSTITUTION	Midwestern Higher Education Commission, Minneapolis, MN.
PUB DATE	Aug 93
NOTE	94p.
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	Audiovisual Aids; Computer Networks; Computer Peripherals; Computer System Design; Electronic Equipment; *Equipment Standards; *Facility Guidelines; Higher Education; *Interactive Video; *Intercollegiate Cooperation; *Purchasing; Technological Advancement
IDENTIFIERS	Midwestern Higher Education Commission; *United States (Midwest)

ABSTRACT

This report presents recommendations on interactive video transmission standards, equipment, room designs, and service plans for member institutions of the Midwestern Higher Education Commission (MHEC) and reviews MHEC's efforts to find and contract for such services with vendors. The report describes the MHEC objective of establishing a dial-up, high speed, two-way interactive video network across the Midwest and the service vendor evaluation process. It notes the four service levels identified and the presentation and demonstration of vendors' plans. The seven recommendations include: (1) using one standard for all equipment; (2) purchasing the product lines of British Telecom (BT) and Compression Labs, Inc.; (3) adopting certain equipment purchasing policies; (4) use by institutions of the MHEC Telecommunications Network for transmission of interactive video signals; (5) urging institutions to consider purchasing one of three MHEC-defined room systems to meed individual needs; (6) urging institutions to consider purchasing one of four MHEC-defined service levels; and (7) using of the products of BT North America, Inc. for BT product lines and Norstan Communications, Inc. for CLI product lines. Appendixes contain program agreements with BT and Norstan, sample costs, request for information, information in the MHEC Virtual Private Network, and a list of MHEC personnel. (JB)

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ED 383 247

MIDWESTERN HIGHER EDUCATION COMMISSION

Interactive Video Program

Final Report and Recommendations

Prepared for Institutions of Higher Education and State Agencies
in the MHEC Member States of:
Illinois, Kansas, Michigan, Minnesota, Missouri, Nebraska, and Ohio

The Midwestern Higher Education Commission
Telecommunications Committee

IHE028359

August 1993

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The mission of MHEC is to improve higher education opportunities and services in the Midwest region through interstate cooperation and resource sharing. MHEC programs include activities to:

- produce regional cost savings to benefit all colleges and universities
- expand student access
- support public policy development through analysis and information exchange
- facilitate regional cooperative academic programming
- encourage quality management
- promote economic growth through higher education and industry innovation

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May 25, 1994

Dear Colleague

Since the preparation of this report, the State of Wisconsin has joined the Midwestern Higher Education Compact. The Commission is pleased to announce that the equipment, services and discount prices offered under the MHEC interactive video program agreements with British Telecommunications North America (BTNA) and Norstan Communications (CLI) are available to all public and independent nonprofit institutions of higher education in Wisconsin effective immediately. MHEC's other cost savings initiatives and services are now available to Wisconsin higher education as well.

We are very pleased to welcome Wisconsin to the Compact and we look forward to working with our higher education colleagues on projects mutually beneficial to all.

Sincerely,

David Murphy

David Murphy
President

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August 6, 1993

Higher Education Leadership
MHEC Member States

Dear Colleagues:

We are pleased to present the following report on interactive video transmission standards, equipment, room designs and service plans for your consideration. It is the product of an intensive six-month effort by the MHEC Telecommunications Committee. The Committee was established by the Commission in 1992 for the purpose of developing interstate telecommunication initiatives. Its goals are to reduce costs and improve the quality of telecommunication services available to postsecondary institutions and state agencies in MHEC member states. Committee members are:

Kenneth Johnson, Chair
Central Michigan University

Coleman Burton
University of Missouri System

Kia Malott
Southern Illinois University

David Murphy
MHEC

Gregory Ashe
The Ohio State University

Stephen Cawley
University of Minnesota, Twin Cities

Ruth Michalecki
University of Nebraska

Barbara Paschke
Kansas Board of Regents

Two major, national vendors have agreed to provide MHEC with special discount pricing on interactive video CODECs, MCUs, peripheral equipment, room design packages, and maintenance programs. These offerings are being made available to all institutions of higher education and state agencies in MHEC member states (see Appendices 1 and 2).

The Commission is very proud of the MHEC Telecommunications Committee's accomplishments. It is our hope that after reading this report you will share our enthusiasm for their work. We believe that this program will benefit many colleges and uiniversities in our member states and would appreciate receiving your comments regarding its value. We look forward to responding to your inquiries in the months ahead.

Sincerely,

David Murphy

David Murphy
President

DM/db
Enclosure
cc: MHEC Commissioners

MHEC INTERACTIVE VIDEO PROGRAM

Final Report

Background

Evaluation Process

Findings and Recommendations

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MHEC Interactive Video Program

Final Report

August 1993

Background

The Committee: The MHEC Telecommunications Committee was established in 1992 to develop interstate telecommunications initiatives on behalf of the Midwestern Higher Education Commission (MHEC). The Commission seeks to reduce the costs and improve the quality of telecommunications services available to post-secondary educational institutions and state agencies throughout the Midwest. The Telecommunications Committee receives its counsel from an assembly of state representatives and network committees representing higher education in participating states. Its findings and recommendations are submitted to MHEC for implementation, and then made available to all public and private institutions of post-secondary education and state agencies in MHEC member states. The Telecommunications Committee members are:

Kenneth Johnson, Chair
Central Michigan University

Coleman Burton
University of Missouri System

Kia Malott
Southern Illinois University

David Murphy
MHEC

Gregory Ashe
The Ohio State University

Stephen Cawley
University of Minnesota, Twin Cities

Ruth Michalecki
University of Nebraska

Barbara Paschke
Kansas Board of Regents

The MHEC Telecommunications Network: The first major program initiative of the Telecommunications Committee was the creation of a Virtual Private Network (VPN) for transmitting voice, data, and video signals. The VPN was established through an agreement with Sprint Communications, and is officially known as the MHEC Telecommunications Network. By using a "private" portion of Sprint's fiber-optic lines, MHEC participants are able to send digitally compressed signals across the Midwest and nation at substantially discounted prices. *(See Appendix 4 for a brochure about the MHEC VPN.)*

The Interactive Video Program: The second program initiative is to implement a dial-up, high-speed, two-way interactive video network across the Midwest using the MHEC Telecommunications Network. MHEC and the Telecommunications Committee believe that distance learning technologies and video conferencing offer many unique opportunities to share high-quality academic programs and services in a very cost-efficient manner. Many institutions of higher education in MHEC states are either considering or have already begun implementing interactive video projects.

The objective of the MHEC Interactive Video Program is to make available low-cost, two-way interactive video equipment, room designs, and network services to institutions and state agencies in MHEC member states. The program requires high-quality video technology and the most comprehensive service offerings possible to meet the Midwest's educational communications needs. It seeks to provide the lowest pricing possible, and make that pricing available to all member institutions and state agencies.

Evaluation Process

Preliminary Analysis: To develop this Interactive Video Program, MHEC first analyzed an extensive body of information gathered from similar projects conducted by the Michigan Collegiate Telecommunications Association (MiCTA), the State of Kansas, and the Ohio Aerospace Institute. MHEC gratefully acknowledges the contributions of these organizations to the planning of this program.

Request for Information: In March 1993, MHEC's Telecommunications Committee issued a Request for Information (RFI) to numerous national vendors of interactive video equipment and asked for their written responses. The RFI covered the basic MHEC requirements for both the necessary video equipment–Channel Service Units (CSUs), CODECs meeting the CCITT H.261 Standard, and Multipoint Control Units (MCUs) meeting the CCITT H.261 Standard–as well as classroom and conference room designs. The room designs were to include detailed information on the audio systems, cameras, and the chairman/instructor controls available for use. In all, twelve separate vendors, representing 6 different CODEC manufacturers, responded to this request. *(See Appendix 5 for a copy of the RFI.)*

To evaluate these responses, the Telecommunications Committee held a series of meetings in St. Louis on May 10 and 11, 1993. After briefly discussing the overall objectives of the RFI, evaluation of the responses was separated into three areas: network design, hardware/software capabilities, and room designs. After the initial reading of each proposal, several vendors were removed for failing to meet the basic specifications outlined in the RFI. Discussions then centered

around a comparison of the vendors' features, pricing, and total system design capabilities, including such items as proprietary algorithms, encryption, graphics capabilities, available data ports, custom turnkey solutions, "Rollabout" units, and design and consultation services. From these discussions, the Committee recommended that three vendors be invited to make formal presentations to the Committee.

During this series of meetings, the Committee composed an initial list of recommendations with a two-fold purpose in mind–to assist the Committee's discussion and evaluation of the vendors' proposals on common terms and products, and to provide MHEC members with a "guide" to the complicated decisions surrounding any interactive video purchase. In reviewing all of the original proposals, the Committee identified three potential room designs that member institutions would be most likely to install. These systems were carefully developed in a "stair-step" fashion to ensure that equipment used at one level could be easily reused, upgraded, or replaced as an institution's needs required (see Figure 1). In addition to these three options, the Committee included a provision for complete room customization. These room recommendations, in addition to a detailed list of equipment pricing, consultation and design services, and a description of warranty and repair services, formed the basis of evaluation when the Committee reconvened on June 15 and 16, 1993, to receive vendor presentations.

Figure 1: Suggested Room Design Options for Different Uses

Option 1: Roll-around	
Number of people	6-10
Suggested uses	Small group teleconferences, seminars, and remote site observation.
Basic equipment	A self-contained video unit including a camera, monitor, CODEC, and sound system, all housed in a wheeled cabinet. The unit should also include a type of picture-in-picture (PIP) capability.
Suggested optional equipment	Document camera, VCR, slide unit.

Option 2: Roll-around Plus	
Number of people	12-16
Suggested uses	Teleconferences, seminars, remote observation, lectures.
Basic equipment	Same as above, with addition of document camera, additional camera(s), additional monitor(s), and an expanded audio system.
Suggested optional equipment	PIP, VCR, slide unit.

Option 3: Classroom	
Number of people	16-32
Suggested uses	Larger teleconferences, seminars, remote observation, lectures, and classroom teaching.
Basic equipment	2 cameras, document camera, CODEC, preview monitors, at least 2 display monitors, and an advanced audio system.
Suggested optional equipment	3-chip cameras, additional display or preview monitors, VCR, slide unit, Laser Disc player.

The vendors were allotted 2 hours each for their presentations, and were expected to have responded in writing beforehand with additional information. Based on the information received in both the oral and written responses to the Committee's questions and recommendations, the vendors were accepted into the final 2-stage round of the evaluation process. The first stage required a written response to the final questions of the Committee, including explanations and clarifications on such points as:

Records: The Committee sought to have a copy of all sales, upgrade, and maintenance invoices sent to MHEC's headquarters in Minneapolis by the vendor, allowing MHEC to collect regional information about the volume and type of activity under the agreement.

Regional Treatment: The Committee requested vendor assurances that all announcements of upgrades, bug fixes, or new products would be sent to all purchasing sites and MHEC headquarters.

Upgrade Pricing: The Committee sought a provision where the vendor agrees to provide all CODEC and MCU related product functionality upgrades at no more than five percent above the manufacturer's price to the vendor.

Site Consultation Fee: The Committee asked that the vendor agree to credit the cost of site consultation services toward the purchase of CODEC/MCU options/equipment and room design packages. The initial site consultation fee was not to exceed $1,500.

Low Price Guarantee: The Committee asked that the vendor guarantee that MHEC members would receive the lowest price for the CODEC and MCU equipment and options. If a lower price was bid to any individual MHEC member from any vendor, MHEC's vendor would agree to beat that price offer to all MHEC members.

Duration of Agreement: The Committee sought a one year agreement with two one-year renewal options to guarantee the prices offered on all equipment (CODECs, MCUs, and room designs), and a two year agreement with one one-year renewal option to guarantee the prices of all maintenance and service agreements.

Proprietary Information: The Committee requested that pricing information included under the MHEC umbrella agreement be proprietary.

In addition to responding to these policies, the vendors were asked to provide pricing for a second set of Committee-developed recommendations concerning first year warranties and optional levels of service. For the first year's warranty, the Committee decided to seek a provision which, at no additional cost to the institution, would provide a four hour response time on remote diagnostics, and twenty-four hour response time for on-site diagnostics and service. The Committee recommended that this provision begin following on-site delivery, testing and burn-in, and customer acceptance of the equipment. In addition to this warranty provision, the Committee asked that four optional levels of service be offered by the vendor, tiered much the same way as the suggested room systems. In this way, the Committee sought to design service levels that were sensitive to each institution's needs and budgets. The four levels are:

Level 1: An arrangement where all services–phone support, remote diagnostics, depot repair (repair and return), labor, and materials–would be provided at a per-hour or per-item rate.

Level 2: A low-cost retainer agreement where the vendor provides phone support and a four hour response for remote diagnostics at no additional cost to the customer. Depot repair (repair and return) would be provided at an additional per-hour rate for labor plus the cost of materials.

Level 3: A low-cost retainer agreement where the vendor provides phone support, a four hour response for remote diagnostics, and a hardware warranty (ship and replace) at no additional cost to the customer. All time and labor would be provided at an additional per-hour cost.

Level 4: A full-service agreement where the vendor provides phone support, a four hour response for remote diagnostics, a hardware warranty (ship and replace), and on-site twenty-four hour response at no additional cost to the customer.

The second stage of the final evaluation involved a hands-on, side-by-side demonstration of the BT and CLI equipment. On July 15, 1993, the Committee convened at Central Michigan University. Representatives from each of the vendors were in attendance. Transmissions took place between the Committee in Mt. Pleasant, Michigan, and the remote site at North Central Michigan College at speeds of 112 kbps, 384 kbps, 768 kbps, and full T-1. In addition to operating between CLI and BT CODECs, the Committee also demonstrated interoperability between CODECs manufactured by CLI and BT. It was generally agreed that at speeds below 384 kbps, the CODECs lacked the clarity of picture or the motion-handling capability for general classroom use. At 768 kbps, the Committee agreed that the signals from both the BT and CLI CODECs were very suitable for classroom use; at full T-1, the signals of both had closely approached broadcast TV quality.

After completing the hands-on test, and receiving the final information from the vendors, the Committee met once again via conference call, and issued the following recommendations.

Findings and Recommendations

1. **The MHEC Telecommunications Committee recommends that Midwestern Higher Education institutions endorse the CCITT H.261 Standard for all CODEC and MCU equipment.**

   The Committee, recognizing that interoperability across the Midwest and the world is of prime importance to higher education, recommends that MHEC adopt a common, basic standard for all telecommunications and video transmission.

Recommended CCITT Standards

Overall	H.320
Video Coding	H.261, both CIF and QCIF at 30 FPS. Full CIF resolution 288 lines x 352 pixels; QCIF 144 lines x 176 pixels.
Framing and Signaling Structure	H.221
Signaling	H.242
Signaling	H.230
Audio Coding	G.722 (50 to 7000Hz ADPCM) fallback to G.711 (A law or μ law) (300 to 3400Hz PCM) or G.728 (300 to 3400Hz) user selectable.
Video Input/Output	NTSC 525 line 60Hz.
Transmission Signal	H11 (T-1). 15 way sub miniature D-type interface, and RS-449 37 way subminiature D-type interface Clock rate @1.544 Mbps. Channel Coding. AMI/B8ZS per G.703, G.704 and G.733. RS449 and RS422 interfaces. Data rates. Selectable between 56/64 kbps and primary port clock rate in 56/64 kbps increments.
MCU Audio Mixing	H.231.
MCU Conference Control	H.221 (BAS codes), chairman control (on issue of recommendation by CCITT).

2. **Based on its adoption of the CCITT H.261 Standard, and on its research and evaluation, the MHEC Telecommunications Committee reports that only CODECs and MCUs from British Telecom (BT) and Compression Labs, Inc. (CLI) meet both the CCITT Standards and the Telecommunications Committee requirements. Accordingly, the Committee recommends these two product lines for consideration by colleges and universities.**

   As discussed earlier, several vendors were removed from consideration because they did not comply with the endorsed CCITT Standards. For the remaining vendors, comparison of the features, pricing, and total system design capabilities played an important role.

3. **In addition to the above CCITT Standards and MHEC requirements, the Telecommunications Committee encourages each institution to purchase the equipment most similar to the equipment at the site(s) most frequently accessed with interactive video technology.**

   The Committee feels very strongly that institutions should purchase the same CCITT (MHEC) standards compatible equipment most prevalent in the institution's home state, or the equipment used by the institution's most frequent interactive video partner. While the adoption of the CCITT Standards will allow a high quality signal to be transmitted between unlike CODECs, the best picture quality (both sending and receiving) will occur between CODECs of the same brand and model. Multipoint video conferencing is much easier if the CODECs and MCUs are from the same manufacturer. Some functionality may be lost when CODECs from different manufacturers operate at the standard in point-to-point video conferencing, and even more functionality may be lost when CODECs from different manufacturers are linked in a multipoint conference.

4. **The MHEC Telecommunications Committee recommends that institutions use the MHEC Telecommunications Network for transmission of their interactive video signals where possible.**

   Regardless of whether an institution uses the MHEC VPN to carry its voice or data traffic, the fiber-optic links of the MHEC VPN offer substantial quality advantages to participating institutions for interactive video applications. The dial-up capability of the VPN, the reduced transmission rates, and the availability of dedicated T-1 links make the MHEC Telecommunications Network a competitive solution for interactive video transmission. MHEC's telecommunications carrier, Sprint Communications, is committed to providing quality network services to MHEC

members. *(See Appendices 3 and 4 for descriptions of the network and the cost of its use for interactive video transmissions among states.)*

5. **To simplify the complex decisions about room and system designs, the MHEC Telecommunications Committee recommends that institutions consider purchasing one of the three MHEC-defined room systems to meet individual needs.**

   The maze of cameras, monitors, cabinets, wiring, CODECs, can get very confusing in a short period of time, making even a simple decision to proceed on a small scale balloon into numerous following decisions. MHEC hopes to simplify at least some of those decisions by defining three common rooms that institutions will be most likely to purchase. In addition, of course, institutions retain the option of designing their own rooms or having the vendor perform a full customization of any room to meet the institution's needs. Each of these room systems has specially negotiated MHEC-member prices.

Option 1: Roll-around	
Number of people	6-10
Suggested uses	Small group teleconferences, seminars, and remote site observation.
Basic equipment	A self-contained video unit including a camera, monitor, CODEC, and sound system, all housed in a wheeled cabinet. The unit should also include a type of picture-in-picture (PIP) capability.
Suggested optional equipment	Document camera, VCR, slide unit.
Option 2: Roll-around Plus	
Number of people	12-16
Suggested uses	Teleconferences, seminars, remote observation, lectures.
Basic equipment	Same as above, with addition of document camera, additional camera(s), additional monitor(s), and an expanded audio system.
Suggested optional equipment	PIP, VCR, slide unit.
Option 3: Classroom	
Number of people	16-32
Suggested uses	Larger teleconferences, seminars, remote observation, lectures, and classroom teaching.
Basic equipment	2 cameras, document camera, CODEC, preview monitors, at least 2 display monitors, and an advanced audio system.
Suggested optional equipment	3-chip cameras, additional display or preview monitors, VCR, slide unit, Laser Disc player.

6. **To simplify the complex decisions about service and warranty plans, the MHEC Telecommunications Committee recommends that institutions consider purchasing one of the four MHEC-defined service levels to meet individual needs.**

Because the size and missions of midwestern colleges and universities varies greatly, MHEC has tried to remain sensitive to the needs of all sectors of higher education. Larger institutions, for example, may be comfortable performing their own service and maintenance, while smaller institutions may be more comfortable contracting for scheduled service and maintenance. To meet these different needs, the Committee has defined four levels of service for institutional consideration. Each service level takes advantage of specially negotiated MHEC-member pricing.

Level 1: An arrangement where all services–phone support, remote diagnostics, depot repair (repair and return), labor, and materials–would be provided at a per-hour or per-item rate.

Level 2: A low-cost retainer agreement where the vendor provides phone support and a four hour response for remote diagnostics at no additional cost to the customer. Depot repair (repair and return) would be provided at an additional per-hour rate for labor plus the cost of materials.

Level 3: A low-cost retainer agreement where the vendor provides phone support, a four hour response for remote diagnostics, and a hardware warranty (ship and replace) at no additional cost to the customer. All time and labor would be provided at an additional per-hour cost.

Level 4: A full-service agreement where the vendor provides phone support, a four hour response for remote diagnostics, a hardware warranty (ship and replace), and on-site twenty-four hour response at no additional cost to the customer.

7. **The MHEC Telecommunications Committee recommends the following companies for institutional consideration in making purchases of CODECs, MCUs, room system packages, or service plans:**

BT North America, Inc. for BT product lines

Norstan Communications, Inc. for CLI product lines

After careful evaluation of twelve separate vendor proposals, in a series of meetings and conferences over a period of six months (March to August, 1993), the Telecommunications Committee has selected Norstan Communications and BT North America as its vendors of choice to recommend to midwestern higher education. These two firms have met the standards, guidelines, pricing goals, and service commitments sought by the MHEC Telecommunications Committee in its Request for Information. Each has agreed to offer all (501(c)3) colleges, universities, and state agencies in MHEC member states extremely competitive equipment pricing, a full range of room design and service plan options, and custom design and consultation services under the provisions of an umbrella agreement with MHEC . In their written responses and oral presentations, BT and

Norstan consistently proved the quality of their respective products, the integrity of their companies, and the commitment of their service teams to meet the needs and expectations of higher education in MHEC states. *(See Appendices 1 and 2 for the MHEC pricing agreements with BT North America and Norstan.)*

MHEC Defined Equipment, Room Designs, and Services	Recommended Vendors
CODECs	
CLI's Rembrandt II/VP	**Norstan** (*MHEC recommends the purchase of either Application Package 2 or 3).*
BT's VC 2300	**BT North America**
MCUs	
CLI's MCU-2	**Norstan**
BT's VC 4101 MCU	**BT North America**

MHEC Defined Equipment, Room Designs, and Services	Recommended Vendors and Models
Room Designs	
Option 1: Roll-around	**Norstan** : Eclipse, Gallery 125/135, S-27, S-35 **BT North America**: VC-93-1 IR, VC-93-1 TS
Option 2: Roll-around Plus	**Norstan**: Gallery 225/235, D-27, D-35 **BT North America**: VC-93-2 IR, VC-93-2 TS
Option 3: Classroom	**Norstan**: Gallery 225/235, D-27, D-35 **BT North America**: DXL-102, DXL-2000
Custom Room *please note that the custom rooms cited are only examples of the range of possibilities.*	**Norstan** : Custom Room Option, additional on-site consultation services **BT North America** : DXL-2000, additional on-site consultation services

MHEC Defined Equipment, Room Designs, and Services	Recommended Vendors
Service Agreements	
Level 1: Time and Material at Quoted Cost	**Norstan** for CLI Products **BT North America** for BT Products
Level 2: Base Retainer for Remote Diagnostics plus Time and Material at Quoted Cost	**Norstan** for CLI Products **BT North America** for BT Products
Level 3: Base Retainer for Extended Hardware Warranty and Remote Diagnostics, plus Time and Materials at Quoted Cost	**Norstan** for CLI Products **BT North America** for BT Products
Level 4: Full Service Base Retainer Including RemoteDiagnostics, Extended Harware Warranty and Onsight Response at No Added Cost	**Norstan** for CLI Products **BT North America** for BT Products

Further Information

For further information regarding the contents of this report, or its findings and recommendations on interactive video equipment, room designs, service plans and/or related pricing, interested institutions and state agencies should contact the MHEC offices, their state representative to the MHEC Telecommunications Committee, or the recommended vendors directly.

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Recommended Vendors

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Appendix 1

MIDWESTERN HIGHER EDUCATION COMMISSION

INTERACTIVE VIDEO PROGRAM AGREEMENT

WITH

BT NORTH AMERICA, INC.

The following provisions and pricing for equipment, room designs, warranties, and service plans are being made available to all public and independent [501(c)3] institutions of postsecondary education and state agencies in MHEC member states through a joint agreement between the Midwestern Higher Education Commission and BT North America, Inc. The effective date of this agreement is August 1, 1993.

BEST COPY AVAILABLE

BT North America Inc. and Innovative Communications Inc. Response to MHEC RFI for Videoconferencing Systems

July 7, 1993

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RE–0493–32–C

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SECTION 1 – SERVICE AND SUPPORT

The role of the Systems Integrator is not only to provide the proper selection of equipment and features to support Distance Learning/Videoconferencing applications, but also to provide operational support and service to ensure total system integrity. The very nature of distance learning/Videoconferencing suggests that the sites will be geographically dispersed, making trouble determination and user support difficult. BT North America, Inc. (BT) and Innovative Communications, Inc. (ICI) have the solution in providing user support, service, and fast response in resolving system malfunctions.

ICI's DXL–2000 and VC–93 series systems provide users with the most sophisticated tools and support available to contend with the operational complexity and diverse locations of todays Distance Learning/Videoconferencing environment.

Operational Scenario

The site components, network, and operating characteristics, which make up a Distance Learning/Videoconferencing system, sometimes can interact with each other and result in apparent performance degradation. When a user, typically an instructor, experiences a problem he/she usually begins by contacting the site coordinator. Then the site coordinator begins the arduous task of problem identification and resolution. Testing and ruling out the various components as being the cause of the problem in a system or network can be very time consuming. ICI's Remote Diagnostic system allows a technician to call into the site experiencing the problem and perform all testing and status monitoring of equipment just as if he/she were On–Site. The technician can gather statistical data, perform measurements, initiate calibration functions, and isolate failed equipment.

The Remote Diagnostics system helps reduce the need for a technician to travel to one or more sites for problem determination. The system identifies and isolates malfunctions more quickly, thereby providing a more responsive service. The economical and technical impact of not having remote diagnostics capabilities at one's command can be significant.

SECTION 2 – PRICE LIST, EQUIPMENT

Network Equipment

Codec	Equipment	Installation
VC 2300 Codec Incl. VC 3338 Network Interface T1, E1 & RS–449	$21,465	$1,000, Note 1
VC 2300 Codec Incl. VC 3336 Network Interface TWIN V.35	21,465	$1,000, Note 1
VC 3337 Telemetry	2,562	Note 2
VC 3336 Network Interface TWIN V.35	3,200	Note 2
VC 3334 Full Feature Video	9,453	Note 2

Inverse Multiplexer	Equipment	Installation
Ascend MB+1DSX–2P Inverse Multiplexer	$4,334	$400
Ascend MB+NX Bandwidth Aggregation	3,250	Note 3
Ascend MB+HHT Palmtop Controller	541	Note 3
Ascend MBHD V.35 Cable	217	Note 3
Ascend MBHD RS–449 Cable	163	Note 3

Multipoint Control Unit	Equipment	Installation
VC 4101 MCU 8 Port	$62,000	$3,550

Notes

1. Contracted with and provided by ICI. Reduced to $400 if an (Instructional Video or Videoconference) Room is purchased in conjunction with the VC 2300.
2. This price is included in the price for the VC 2300.
3. This price is included in the price for the MB+1DSX–2P

Conditions

1. These prices are valid for 1 year.
2. These prices are in USA dollars.
3. These prices are FOB Saginaw, MI.
4. These prices do not include Sales Tax.
5. BT Terms & Conditions apply.

Room Equipment	Equipment	Installation
DXL–2000 Instructional Video Room	$56,935	$2,120
DXL–102 Instructional Video Room	29,204	2,120
VC–93–1IR Roll–Around	29,126	2,120
VC–93–1TS Roll–Around	37,879	2,120
VC–93–2IR Roll–Around Plus	32,222	2,120
VC–93–2TS Roll–Around Plus	39,206	2,120

Ancillary Equipment	Equipment	Installation
Network Access Equipment Remote Control	$450	Note 1
Remote Location Camera & VCR Control	450	Note 1
Instructor Camera Tracker	2,868	Note 1
Monitor Power Remote Control	550	Note 1
Graphics Stand, Note 2	3,250	Note 1
VHS VCR, Note 3	2,200	Note 1
Laser Disk Player	825	Note 1
Slide–To–Slide Converter	2,958	Note 1
Louver Panel (2x4 feet)	260	Upon Request

Miscellaneous	Equipment	Installation
Site Survey and Modification Recommendations	$1,500 Note 4	Upon Request

Notes

1. This price is included in the price of the Room.
2. This is included in the VC–93–2IR and VC–93–2TS Roll–Around Plus.
3. This is included in the DXL–2000 Instuctional Video Room.
4. This will be refunded upon purchase of a Room.

Conditions

1. These prices are valid for 1 year.
2. These prices are in USA dollars.
3. These prices are FOB Saginaw, MI.
4. These prices do not include Sales Tax.
5. ICI Terms & Conditions apply.

SECTION 3 – PRICE LIST, SERVICE

Level 1

An arrangement where all services – phone support, remote diagnostics, depot repair (repair and return), labor, and materials – would be provided at a per–hour or per–item rate.

Network Equipment

Codec	1st Year	Following Years
VC 2300 Codec Incl. VC 3338 Network Interface T1, E1 & RS–449	Included	$55.00 per hour, plus materials & shipping
VC 2300 Codec Incl. VC 3336 Network Interface TWIN V.35	Included	$55.00 per hour, plus materials & shipping
VC 3337 Telemetry	Included	$55.00 per hour, plus materials & shipping
VC 3336 Network Interface TWIN V.35	Included	$55.00 per hour, plus materials & shipping
VC 3334 Full Feature Video	Included	$55.00 per hour, plus materials & shipping

Multipoint Control Unit	1st Year	Following Years
VC 4101 MCU 8 Port	Included	$55.00 per hour, plus materials & shipping
VC 4102 MCU 1 Port Upgrade	Included	$55.00 per hour, plus materials & shipping

Room Equipment	1st Year	Following Years
DXL–2000 Instructional Video Room	Included	$55.00 per hour, plus materials & shipping
DXL–102 Instructional Video Room	Included	$55.00 per hour, plus materials & shipping
VC–93–1IR Roll–Around	Included	$55.00 per hour, plus materials & shipping
VC–93–1TS Roll–Around	Included	$55.00 per hour, plus materials & shipping
VC–93–2IR Roll–Around Plus	Included	$55.00 per hour, plus materials & shipping
VC–93–2TS Roll–Around Plus	Included	$55.00 per hour, plus materials & shipping

Level 2

A low–cost retainer agreement, where the vendor provides phone support and 4–hour response for remote diagnostics at no additional costs to the customer. Depot repair (repair and return) would be provided at an additional per–hour rate for labor plus the cost of materials.

Network Equipment

Codec	Retainer	Labor & Materials
VC 2300 Codec Incl. VC 3338 Network Interface T1, E1 & RS–449	$315.00 per year	$55.00 per hour, plus materials & shipping
VC 2300 Codec Incl. VC 3336 Network Interface TWIN V.35	315.00 per year	$55.00 per hour, plus materials & shipping
VC 3337 Telemetry	38.00 per year	$55.00 per hour, plus materials & shipping
VC 3336 Network Interface TWIN V.35	48.00 per year	$55.00 per hour, plus materials & shipping
VC 3334 Full Feature Video	142.00 per year	$55.00 per hour, plus materials & shipping

Multipoint Control Unit	Retainer	Labor & Materials
VC 4101 MCU 8 Port	$930.00 per year	$55.00 per hour, plus materials & shipping
VC 4102 MCU 1 Port Upgrade	105.00 per year	$55.00 per hour, plus materials & shipping

Room Equipment	1st Year	Following Years
DXL–2000 Instructional Video Room	$854.00 per year	$55.00 per hour, plus materials & shipping
DXL–102 Instructional Video Room	438.00 per year	$55.00 per hour, plus materials & shipping
VC–93–1IR Roll–Around	437.00 per year	$55.00 per hour, plus materials & shipping
VC–93–1TS Roll–Around	568.00 per year	$55.00 per hour, plus materials & shipping
VC–93–2IR Roll–Around Plus	483.00 per year	$55.00 per hour, plus materials & shipping
VC–93–2TS Roll–Around Plus	588.00 per year	$55.00 per hour, plus materials & shipping

Level 3

A low–cost retainer agreement agreement where the vendor provides phone support, a 4–hour response for remote diagnostics, and a hardware warranty (ship and replace) at no additional cost to the customer. All time and labor would be provided at an additional per–hour cost.

Network Equipment

Codec	Cost 1st Year	Cost 2nd Year	Labor
VC 2300 Codec Incl. VC 3338 Network Interface T1, E1 & RS–449	$315.00 per year	$3,610.00 per year	$55.00 per hour, plus shipping
VC 2300 Codec Incl. VC 3336 Network Interface TWIN V.35	$315.00 per year	$3,610.00 per year	$55.00 per hour, plus shipping
VC 3337 Telemetry	$38.00 per Year	$313.00 per year	$55.00 per hour, plus shipping
VC 3336 Network Interface TWIN V.35	$48.00 per year	$343.00 per year	$55.00 per hour, plus shipping
VC 3334 Full Feature Video	$142.00 per year	$1,237.00 per year	$55.00 per hour, plus shipping

Multipoint Control Unit	1st Year	2nd Year	Labor
VC 4101 MCU 8 Port	$930.00 per year	$7,615.00 per year	$55.00 per hour, plus shipping
VC 4102 MCU 1 Port Upgrade	$105.00 per year	$904.00 per year	$55.00 per hour, plus shipping

Room Equipment	1st Year	2nd Year	Labor
DXL–2000 Instructional Video Room	$854.00 per year	$3,847.00 per year	$55.00 per hour, plus shipping
DXL–102 Instructional Video Room	$438.00 per year	$2,460.00 per year	$55.00 per hour, plus shipping
VC–93–1IR Roll–Around	$437.00 per year	$2,456.00 per year	$55.00 per hour, plus shipping
VC–93–1TS Roll–Around	$568.00 per year	$2,894.00 per year	$55.00 per hour, plus shipping
VC–93–2IR Roll–Around Plus	$438.00 per year	$2,611.00 per year	$55.00 per hour, plus shipping
VC–93–2TS Roll–Around Plus	$588.00 per year	$2,960.00 per year	$55.00 per hour, plus shipping

Level 4

A full–service agreement whereby the vendor provides phones support, a 4–hour response for remote diagnostics, a hardware warranty (ship and replace), and on–site 24–hour response at no additional cost to the customer.

Network Equipment

Codec	Retainer 1st Year	Retainer 2nd Year	Labor
VC 2300 Codec Incl. VC 3338 Network Interface T1, E1 & RS–449	$2,100.00 per year	$5,395.00 per year	Note 2
VC 2300 Codec Including VC 3336 Network Interface TWIN V.35	$2,100.00 per year	$5,395.00 per year	Note 2
VC 3337 Telemetry	Note 1	Note 1	Note 2
VC 3336 Network Interface TWIN V.35	Note 1	Note 1	Note 2
VC 3334 Full Feature Video	Note 1	Note 1	Note 2

Multipoint Control Unit	1st Year	2nd Year	Labor
VC 4101 MCU 8 Port	$5,960.00 per year	$12,645.00 per year	Note 2
VC 4102 MCU 1 Port Upgrade	$662.00 per year	$1,361.00 per year	Note 2

Room Equipment	1st Year	2nd Year	Labor
DXL–2000 Instructional Video Room	$5,555.00 per year	$8,402.00 per year	Note 2
DXL–102 Instructional Video Room	$3,336.00 per year	$5,7796.00 per year	Note 2
VC–93–1IR Roll–Around	$3,330.00 per year	$5,786.00 per year	Note 2
VC–93–1TS Roll–Around	$4,030.00 per year	$6,924.00 per year	Note 2
VC–93–2IR Roll–Around Plus	$3,578.00 per year	$6,189.00 per year	Note 2
VC–93–2TS Roll–Around Plus	$4,136.00 per year	$7,096.00 per year	Note 2

Notes

1. This price is included is the price for the VC2300.
2. This is included the price for the Retainer.

SECTION 4 – COMMENTS ON COMMERCIAL REQUIREMENTS

Time and Mileage Charges

When responding to any of the service levels, please be advised that the committee is aware of instances where MHEC institutions were disadvantaged by unclear definitions in time and mileage contracts. To avoid misunderstandings, the committee requests that you specify whether your firm charges time and mileage, and if so, how these charges are determined.

The Service charge is based only on the On–Site time, with a minimum charge of 4 hours. Travel expenses are charged at cost and mileage at 35 cents per mile.

Warranty

Thirdly, the committee would appreciate your assistance in clarifying the terms and conditions of your warranty. The Commission is seeking a one–year warranty provision without additional cost to the customer which begins following on–site delivery, testing and burn–in, and customer acceptance. This provision should enable a reasonable time for customers and vendors to get the systems debugged and running properly before the warranty period begins. The warranty provision should provide a 4–hour response for remote diagnostics and 24–hour response for on–site diagnostics and service. In addition, at the time of purchase a full technical manual needs to be provided to each purchase site for the MCUs and Codecs. This provision specifically requests the full technical manual and not the condensed user's manual.

BT's Videoconferencing Warranty, per Terms and Conditions Item 19, are as follows:

> (a) BT warrants the the Equipment will perform in accordance with the manufacturers' specifications, will be free from defects in material or workmanship, and will have been competently installed for a period of thirty (30) days following the date of acceptance by Customer. This warranty does not extend to Equipment which has been misused, neglected or damaged by accident, fire or other casualty, installed, repaired or altered by anyone other than BT or its designee, damaged by failure or neglect to provide proper operating conditions, manufacturing to Customer's design and the fault is due to Customer's design, or removed from the Installation Location. Customer's sole and exclusive remedy for any complaint arising out of or relating to this Agreement, the Equipment, the installation or maintenance thereof, or any delay relative to any foregoing, shall be the repair or replacement of the Equipment by BT, at BT's option. BT shall charge Customer its standard hourly rates plus costs of material in respect of any work performed at the Installation Location at Customer's request to repair or replace Equipment where either the Equipment is not found to be defective or is not covered by this warranty. BT is relieved of its obligation to perform pursuant to this warranty during any period when Customer is in default of payment under this Agreement.
>
> (b) THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OR CONDITIONS OF

MERCHANTABLE QUALITY AND FITNESS FOR A PARTICULAR PURPOSE, CONFORMANCE TO SAMPLE, AND ALL DUTIES AND OBLIGATIONS ARISING BY STATUTE OR OTHERWISE IN LAW OR FROM A COURSE OF DEALINGS OR USAGE OF TRADE, WHETHER CONTAINED IN THIS AGREEMENT OR ELSEWHERE, OR ANY REPRESENTATION WHEREVER MADE, WHETHER IN RELATION TO EQUIPMENT OR LABOR.

ICI warrants that the equipment provided shall operate in accordance with the specifications for a period of one (1) year from the date of acceptance. ICI agrees to remedy at its cost any defect in the equipment that causes the equipment to fail to perform in accordance with the specification during the warranty period. ICI costs shall include labor, transportation, repair and additional installation costs. If any defect is proven to be due solely to Customer's negligence, the Customer shall be required to compensate ICI for its costs in providing technical assistance and for transportation costs.

BT and ICI agree to MHEC's Service Response requirements.

BT and ICI agree to MHEC's Technical Manual requirements.

Records

A copy of all sales, upgrades and maintenance invoices will be sent to MHEC's headquarters in Minneapolis by the vendor, allowing MHEC to collect regional information about the volume of activity under the agreement.

BT and ICI agree to MHEC's requirements.

Regional Treatment

All announcements of upgrades, bug fixes, or new products will be sent to all purchasing sites and MHEC headquarters by the vendor.

BT and ICI agree to MHEC's requirements.

Upgrade Treatment

The vendor agrees to provide all Codec and MCU related product functionality upgrades at no more than 5% above the manufacturer's price to the vendor.

ICI agree to MHEC's requirements.

Site Consultation Fee

The vendor agrees to credit the cost of site consultation services toward the purchase Codec/MCU options/equipment and room design packages. The initial site consultation fees is not to exceed $1500.

ICI agree to MHEC's requirements.

Low Price Guarantee

The vendor guarantees that MHEC members will receive the lowest price for the Codec and MCU equipment and options. If a lower price is bid to any individual MHEC member from any vendor, MHEC's vendor agrees to beat that price offer to MHEC customers.

BT and ICI will offer the same price to all MHEC Members. BT and ICI expects their costs to fall and to be able to pass these reductions onto MHEC Members.

Duration of Agreement

The duration of the vendor's agreement shall be as follows: Prices for all equipment (Codecs, MCUs, and room designs) are guaranteed for one year with two one–year renewal options at the same prices. Prices for all maintenance and service agreements are guaranteed for two years with one one–year option to renew at the first year prices.

BT and ICI guarantee the price for one (1) year. BT and ICIs experience has been that prices have fallen every year. BT and ICI expect this to continue and to be to pass these reductions onto MHEC Members.

Proprietary Information

The pricing information included under the MHEC umbrella agreement is proprietary. Institutions and agencies interested in participating in the program will be asked to sign a statement of non–disclosure prior to receiving the price quotes. In addition, the vendor will agree not to disclose pricing to non–MHEC institutions and agencies.

BT and ICI agree to MHEC's requirements.

Appendix 2

MIDWESTERN HIGHER EDUCATION COMMISSION

INTERACTIVE VIDEO PROGRAM AGREEMENT

WITH

Norstan Communications, Inc.

The following provisions and pricing for equipment, room designs, warranties, and service plans are being made available to all public and independent [501(c)3] institutions of postsecondary education and state agencies in MHEC member states through a joint agreement between the Midwestern Higher Education Commission and Norstan Communications, Inc

Effective Date: August 1, 1993

NORSTAN COMMUNICATIONS

July 6, 1993

Midwestern Higher Education Commission
1300 South Second Street, Suite 130
Minneapolis, MN 55454-1015

Dear MHEC Telecom Committee:

Thank you for the opportunity to provide you with Norstan's best and final proposal.

In an effort to secure the best possible pricing for MHEC and its members, Norstan, CLI and Blumberg have reviewed all component and service pricing and have provided additional discounts where applicable. Attached you will find detailed pricing as requested in your June 23rd letter for the following options:

- Codec Package Options
- Multipoint-2 Options
- Optional Levels of Service

The following qualifications were also requested.

Time and Mileage

Should a Service Technician be dispatched to a MHEC member location covered by Service Levels 1, 2 or 3. Norstan will charge $65 per hour for travel time to and from that location. Level 4 Service coverage includes travel.

Additional Service Locations

To ensure cost-effective on-site service coverage, Norstan has expanded our CLI service areas to meet the territory within MHEC participating states. Please reference the attached map and city listings for locations.

Warranty

Norstan's warranty is described on the attached Service Options sheet. The warranty period will begin following on-site delivery, testing and customer acceptance of Norstan's installation or 30 days from factory ship for customers choosing to handle their own install. Full technical documentation will be provided for all equipment purchased.

Norstan Communications, Inc.
6900 Wedgwood Road — Suite 150
P.O. Box 9001
Maple Grove, Minnesota 55369
612-420-1100

Records

Through Norstan's customer tracking system, complete records on all MHEC sales, upgrades and maintenance invoices will be provided to the MHEC headquarters monthly via disk and/or hard-copy.

Regional Treatment

By utilizing our customer tracking system we will send each MHEC purchasing site and MHEC headquarters information pertaining to CLI upgrades, fixes and/or new products.

Upgrade Pricing/Low Price Guarantee

Norstan has been awarded "the best" Platinum Medallion pricing by CLI for this partnering opportunity with MHEC. In turn, Norstan agrees to provide "most favored" pricing to all MHEC members. This "most favored" pricing will apply to initial purchases as well as upgrades. Please reference the attached letter from Ted Augustine, Vice President-North American Sales for CLI.

Site Consultation Fee

Norstan and Blumberg agree to credit the cost of a site consultation fee ($1,500) toward the cost of Custom Room Design services.

Duration of Agreement

Norstan guarantees all equipment pricing for one year with two one-year renewal options. At renewal, Norstan will guarantee the same price or the then current "most favored" pricing. Norstan will guarantee all maintenance and service offering pricing for two years with a one-year renewal option at the first year prices.

Proprietary Information

Norstan, Blumberg and CLI agree to treat all pricing information as proprietary and confidential.

Please feel free to call us if you have any questions.

Sincerely,

Jeff Benson
Account Executive
612-420-1524

Juelle Welliver
Regional Video Manager
612-420-1246

SUPPORT STRUCTURE

National Service Center

Norstan will provide MHEC members with an 800 number for all support issues. Calls will be answered 7 days a week, 24 hours a day at our National Service Center in Minneapolis. Charges for this service and those described below depend on the level of service contracted. See Service Options for cost details.

Help Desk Support

Norstan will provide Help Desk Support (M-F, 8 to 5) to answer questions for MHEC members. These people are product specialists and are trained to determine if problems are procedural or technical (hardware or software).

Norstan Tech Support/Remote Diagnostics

If a problem is technical, a Video Technical Support Representative will get involved. He/she can dial into the system through a remote diagnostics modem to determine the nature of the problem.

CLI Tech Support

CLI Technical Support is available to Norstan for additional help in problem-solving.

On-Site Support

Should a problem be determined to be hardware in nature, Norstan can (at the customers request) dispatch an on-site technician to fix the problem. Should parts be required, customers covered under Advance Parts Replacement will be shipped within 8 business hours.

Norstan/MHEC Information Line

Norstan will provide an 800 number for answering questions regarding CLI equipment, MHEC pricing, services, seminars and equipment upgrades.

NORSTAN/MHEC

SERVICE OPTIONS

Service Features	1st Year Warranty	Service Level 1	Service Level 2	Service Level 3	Service Level 4
Help desk Support	Included	$35 per hour	Included	Included	Included
Remote Diagnostics	Included	$65 per hour	Included	Included	Included
Software Enhancement	Included	Chargeable	Chargeable	Included	Included
Depot Repair	Not Applicable	Chargeable	Chargeable	Not Applicable	Included
Advance Parts Replacement	Included	Not Available	Not Available	Included	Included
On Site Support	$85 per hour	$85 per hour	$85 per hour	$85 per hour	Included
Overtime	$125 per hour	$125 per hour	$125 per hour	$125 per hour	$125 per hour
Travel	$65 per hour	$65 per hour	$65 per hour	$65 per hour	Included
Standard Coverage Hours	8-5	8-5	8-5	8-5	8-5
Help Desk Response	30 minute	60 minute	30 minute	30 minute	Immediate
Remote Response	2 hour	Best Effort	4 hour	2 hour	60 minute
Advance Replacement	8 hour ship	Not Available	Not Available	8 hour ship	8 hour ship
On Site Response	24 hour	Best Effort	Best Effort	24 hour	24 hour
Annual Costs					
CLI Eclipse	90 days (included)	$0	$500	$900	$1,200
CLI RII Codec	Included in Purchase	$0	$650	$3,000	$3,800
CLI Gallery w/Codec	Included in Purchase	$0	$1,500	$3,900	$5,400
Norstan/Blumberg Room System	Included in Purchase	$0	$1,500	$3,900	$5,400
CLI MCU	Included in Purchase	$0	$1,875	$4,900	$7,000
CLI MP2	Included in Purchase	$0	$3,125	$6,800	$8,400
Ascend Multiband	Included in Purchase	$0	$250	$650	$875
Custom Room Systems	Included in Purchase	$0	Per Site	Per Site	Per Site

Proprietary/For MHEC Members Only

NORSTAN/MHEC

SERVICE LOCATIONS

The following offices will provide on-site support for current MHEC member states.

MINNESOTA
Mpls/St. Paul
Rochester
Duluth
Fargo, ND
Sioux Falls, SD

ILLINOIS
Chicago
Madison, WI
Dubuque, IA
Davenport, IA
St. Louis, MO

MICHIGAN
Detroit
Flint
Kalamazoo
Lansing
Green Bay, WI

MISSOURI
Springfield
St. Louis
Kansas City, KS

KANSAS
Kansas City

OHIO
Toledo
Cleveland
Columbus
Dayton
Cincinnati
Lexington, KY

NEBRASKA
Lincoln
Omaha
Sioux Falls, SD

Norstan will consider additional service locations as MHEC installations require.

CLI CODEC PACKAGE PRICING

CODEC PACKAGE 1	MHEC PRICE
CLI - Rembrandt II/VP (Codec)	$19,500
Application Package 3 (CTX, CTX Plus, QCIF and FCIF)	9,000
RS-449/V.35 Network Interface	1,125
Standards Plus (for H.221 Compliance)	1,500
G.728 Audio	1,500
Codec Package 1 Total	**$32,625***

CODEC PACKAGE 2	
CLI - Rembrandt II/VP Codec	$19,500
Application Package 3 (CTX, CTX Plus, QCIF and FCIF)	9,000
RS-449/V.35 Network Interface	1,125
Codec Package 2 Total	**$29,625***

CODEC PACKAGE 3	
CLI - Rembrandt II/VP Codec	$19,500
Application Package 2 (CTX, QCIF and FCIF)	6,000
RS-449/V.35 Network Interface	1,125
Codec Package 3 Total	**$26,625***

*Modems ($500) are required for remote diagnostics.
*Includes One Year Depot Warranty.
*Installation and training available for $1,500.
*Shipping costs $350 Per Codec.

MULTIPOINT 2 OPTIONS

The CLI Multipoint 2 product allows cascading of up to 28 systems providing a minimum of 112 connections at a full T-1. Please contact Norstan for additional design configuration/pricing.

MCU-2 OPTION 1 - 4 Ports configured to support 4 T-1 connections.

Description	MHEC Price
Base System	$55,500
BPU's (1)	12,000
T1/PRI	15,000
Total 4 Port MCU-2	**$82,500**

MCU-2 OPTION 2 - 8 Ports configured to support 8 768 Kbps connections.

Description	MHEC Price
Base System	$55,500
BPU's (2)	24,000
T1/PRI	15,000
Total 8 Port MCU-2	**$94,500**

*NOTE: These configurations do not include V.35 or RS-499 connections, inverse multiplexers or CSU's. Adding any of these items will reflect in an increase in the MCU-2 price.

*Includes One Year Depot Warranty.
*Installation and training available for $4,500.

NORSTAN ROOM SYSTEMS OVERVIEW

OPTION 1: Small Group Roll Around/Single Monitor

ORDER NUMBER	DESCRIPTION	MHEC PRICE	INSTALLATION AND TRAINING PRICE
	System A - Operating at 112/128 Kbps		
NA-ECL-112	•CLI Eclipse	$18,260	$1,200
	System B - Operating at up to 1.544 mbps		
NB-125-AP3	•CLI Gallery 125	$63,375	$3,500
NB-135-AP3	•CLI Gallery 135	$67,125	$3,500
NB-S27-AP3	•Norstan S-27	$55,270	$3,500
NB-S35-AP3	•Norstan S-35	$56,170	$3,500

OPTION 2: Medium Group Roll Around Plus/Dual Monitor

	System C - Operating at 112/128 Kbps		
NC-225-AP2	•CLI Gallery 225	$65,625	$3,500
NC-235-AP2	•CLI Gallery 235	$70,500	$3,500
NC-D27-AP2	•Norstan D-27	$55,195	$3,500
NC-D35-AP2	•Norstan D-35	$56,995	$3,500
	System D - Operating up to 1.544 mbps		
ND-225-AP3	•CLI Gallery 225	$72,625	$3,500
ND-235-AP3	•CLI Gallery 235	$77,500	$3,500
ND-D27-AP3	•Norstan D-27	$62,195	$3,500
ND-D35-AP3	•Norstan D-35	$63,995	$3,500

OPTION 3: CUSTOM CLASS ROOM

	System E - Operating up to 1.544 Mbps		
NE-BLU-AP3	•Sample Classroom	$84,337	Included

NOTE: Pricing includes (parts only) Depot Warranty.

CLI Eclipse
(Single Monitor System running up to 112/128 Kbps)
NA-ECL-112

Description	MHEC Price
CLI Eclipse	$17,910
Standards Plus with CTX enhanced video	Included
56 Kbps - 128 Kbps operation	Included
Full duplex audio with integrated echo cancellation	Included
Self Guide™ user interface with wireless remote control, icons, on-screen messages, help feature	Included
Speed dialing (1000 location directory in disc memory)	Included
Color camera system with auto focus	Included
Power pan/tilt/zoom	Included
Camera pressers	Included
Picture-in-picture	Included
Still video graphics	Included
Multipoint-ready	Included
Dual V.35 or RS-449 with external dialing control	Included
20 inch color television monitor	Included
Portable cart	Included
Remote diagnostics with integrated modem	Included
CCIT H.320 - QCIF resolution	Included
Integrated Switched 56 or ISDN network interface	Included
FlexCam™ document and auxiliary camera	Included
Shipping	$350
System 1A - CLI Eclipse Total	**$18,260***

-Includes One Year Depot Warranty
-Installation and Training available for $1,200

CLI Gallery 125 Room System
(Single Monitor running up to 1.544 mbps)
NB-125-AP3

Description	MHEC Price
CLI-Gallery Room System	
Gallery 125/Rollabout	$18,750
Front Camera with pan/tilt/zoom/focus	N/C
25" NTSC Motion Monitor	N/C
Voice Crafter Audio System w/2 mics	N/C
Remote Diagnostics Modem	N/C
Enhanced Video Distribution	3,000
CLI 125 Room System Subtotal	$21,750
CLI Video Codec	
Rembrandt II/VP Codec	$19,500
Application Package 3 supporting CTX, CTX Plus and CCITT (QCIF and FCIF)	9,000
RS-449/V.35 Dual V.35 Network Interface w/RS-336	1,125
Single Display Graphics/PIP	2,250
CLI-Codec Subtotal	$31,875
Miscellaneous	
Ascend Multiband Plus (MB-1DSX-1CSU-2P)	$9,200
Shipping	550
Miscellaneous Subtotal	$9,750
CLI 125 Total	**$63,375**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500

CLI Gallery 135 Room System
(Single Monitor running up to 1.544 mbps)
NB-135-AP3

Description	MHEC Price
CLI-Gallery Room System	
Gallery 135/Rollabout	$22,500
Front Camera with pan/tilt/zoom/focus	N/C
35" NTSC Motion Monitor	N/C
Voice Crafter Audio System w/2 mics	N/C
Remote Diagnostics Modem	N/C
Enhanced Video Distribution	3,000
CLI 135 Room System Subtotal	$25,500
CLI Video Codec	
Rembrandt II/VP Codec	$19,500
Application Package 3 supporting CTX, CTX Plus and CCITT (QCIF and FCIF)	9,000
RS-449/V.35 Dual V.35 Network Interface w/RS-336	1,125
Single Display Graphics/PIP	2,250
CLI-Codec Subtotal	$31,875
Miscellaneous	
Ascend Multiband Plus (MB-1DSX-1CSU-2P)	$9,200
Shipping	550
Miscellaneous Subtotal	$9,750
CLI 135 Total	**$67,125**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500

Norstan S-27 Room System w/Cameraman
(Single Monitor running up to 1.544 mbps)
NB-S27-AP3

Description	MHEC Price
Norstan Room System	
(1) Roll about system (choice of cabinet style or wall mountable)	
(1) Gentner GT-700 Full Duplex Audio System with: echo cancellation, mic mixing, (2) mics, (1) Speaker and is rack mountable	
(1) Sony NTSC 27" Monitor (w/PIP)	
(1) AMX Accent Control System (wireless remote) -to control monitor/receiver power, audio system volume, room lighting, VCR functions, graphics camera and slide projector	
(1) JVC TK-1070 2/3" Single CCD Color camera with: HZ-C611 AF 6: 1 auto focus/zoom lens AC-C712 P AC Adapter	
(1) ParkerVision Cameraman CMP-2002E Includes base unit, wireless lapel mic and hand held remote	
(1) Remote Diagnostics Modem	
Norstan Room System Subtotal	$15,895
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 3 supporting CLI CTX and CTX Plus and CCITT (QCIF and FCIF) Algorithms	9,000
(1) RS-449/V.35 Dual Network Interface w/RS-366	1,125
CLI-Codec Subtotal	$29,625
Miscellaneous	
(1) Ascend Multiband Plus (MB-1DSX-1CSU-2P)	$9,200
(1) Shipping	550
Miscellaneous Subtotal	$9,750
Norstan S-27	**$55,270**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500
-Component substitution may be provided

Norstan S-35 Room System w/Cameraman
(Single Monitor running up to 1.544 mbps)
NB-S35-AP3

Description	MHEC Price
Norstan Room System	
(1) Roll about system (choice of cabinet style or wall mountable)	
(1) Gentner GT-700 Full Duplex Audio System with: echo cancellation, mic mixing, (2) mics, (1) JBL speaker and is rack mountable	
(1) Mitsubishi C5-35 MX1 35" Monitor/Receiver	
(1) AMX Accent Control System (wireless remote) -to control monitor/receiver power, audio system volume, room lighting, VCR functions, graphics camera and slide projector	
(1) JVC TK-1070 2/3" Single CCD Color camera with: HZ-C611 AF 6: 1 auto focus/zoom lens AC-C712 P AC Adapter	
(1) ParkerVision Cameraman CMP-2002E Includes base unit, wireless lapel mic and hand held remote	
(1) Remote Diagnostics Modem	
Norstan Room System Subtotal	$16,795
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 3 supporting CLI, CTX and CTX Plux and CCITT (QCIF and FCIF) Algorithms	9,000
(1) RS-449/V.35 Dual Network Interface w/RS-366	1,125
CLI-Codec Subtotal	$29,625
Miscellaneous	
(1) Ascend Multiband Plus (MB-1DSX-1CSU-2P)	$9,200
(1) Shipping	550
Miscellaneous Subtotal	$9,750
Norstan S-35	**$56,170**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500
-Equivalent component substitutions may be provided.

CLI Gallery 225/Room System
(Dual 25" monitor system running up to 112/128 Kbps)
NC-225-AP2

Description	MHEC Price
CLI - Gallery Room System	
(1) Gallery 225/Rollabout	$26,250
(1) Front Camera with Pan/Tilt/Zoom/Focus	N/C
(1) 25" Motion Monitor	N/C
(1) 25" NTSC Motion Monitor	N/C
(1) Voice Crafter Audio System w/2 mics	N/C
(1) Remote Diagnastics Modem	N/C
(1) Elmo 308 Document Camera/Stand	N/C
(1) Auxiliary Camera with Pan/Tilt/Zoom/Focus	3,600
(1) Enhanced Video Distribution	3,000
CLI 225 Room System Subtotal	$32,850
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 2 - Supporting (56 to 384 Kbps) CTX and CCITT (QCIF and FCIF) Algorithms	6,000
(1) RS-449/V.35 Dual V.35 Network Interface w/RS-366	1,125
CLI - Video Codec Subtotal	$26,625
Miscellaneous	
(1) Ascend Multiband 2 (MB-2DSX-2P)	$5,200
(1) Shipping	950
Miscellaneous Subtotal	$6,150
CLI 225 Total	**$65,625**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500

CLI Gallery 235/Room System
(Dual 35" monitor system running up to 112/128 Kbps)
NC-235-AP2

Description	MHEC Price
CLI - Gallery Room System	
(1) Gallery 235/Rollabout	$31,125
(1) Front Camera with Pan/Tilt/Zoom/Focus	N/C
(1) 35" Motion Monitor	N/C
(1) 35" NTSC Motion Monitor	N/C
(1) Voice Crafter Audio System w/2 mics	N/C
(1) Remote Diagnastics Modem	N/C
(1) Elmo 308 Document Camera/Stand	N/C
(1) Auxiliary Camera with Pan/Tilt/Zoom/Focus	3,600
(1) Enhanced Video Distribution	3,000
CLI 235 Room System Subtotal	$37,725
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 2 - Supporting (56 to 384 Kbps) CTX and CCITT (QCIF and FCIF) Algorithms	6,000
(1) RS-449/V.35 Dual V.35 Network Interface w/RS-366	1,125
CLI - Video Codec Subtotal	$26,625
Miscellaneous	
(1) Ascend Multiband (MB-2DSX-2P)	$5,200
(1) Shipping	950
Miscellaneous Subtotal	$6,150
CLI 235 Total	**$70,500**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500

Norstan D-27 Room System w/Cameraman
(Dual 27" Monitor System running up to 112/128 Kbps)
NC-D27-AP2

Description	MHEC Price
Norstan Room System	
(1) Rollabout System (choice of cabinet style or wall mountable)	
(1) Gentner GT-700 Full Duplex Audio System with: echo cancellation, mic mixing, (2) mics, (1) JBL speaker and is rack mountable	
(2) Sony NTSC 27" Monitor (w/PIP)	
(1) AMX Accent control System (wireless remote) to control Monitor/Receiver Power, Audio System Volume, room lighting, VCR functions, graphics camera and slide projector.	
(2) JVC TK-1070 2/3" Single CCD Color Camera	
(1) Parker Visions Cameraman CMP - 2002E -includes base unit, wireless lapel mic. and handheld remote.	
(1) Elmo EV-368 Color Graphics Stand/Camera	
(1) Remote Diagnostics Modem	
Norstan Room System Subtotal	$22,420
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 2 - Supporting (56 to 384 Kbps) CTX and CCITT (QCIF and FCIF)	6,000
(1) RS-449/V.35 Dual V.35 Network Interface w/RS-366	1,125
CLI-Video Codec Subtotal	$26,625
Miscellaneous	
(1) Ascend Multiband 2 (MB-2DSX-2P)	$5,200
(1) Shipping	950
Miscellaneous Subtotal	$6,150
Norstan D-27 total	**$55,195**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500
-Equivalent component substitutions may be provided

Norstan D-35 Room System w/Cameraman
(Dual 35" Monitor System running up to 112/128 Kbps)
NC-D35-AP2

Description	MHEC Price
Norstan Room System	
(1) Rollabout System (choice of cabinet style or wall mountable)	
(1) Gentner GT-700 Full Duplex Audio System with: echo cancellation, mic mixing, (2) mics, (1) JBL speaker and is rack mountable	
(2) Mitsubishi CS-35 MX1 35" Monitor/Receiver	
(1) AMX Accent control System (wireless remote) to control Monitor/Receiver Power, Audio System Volume, room lighting, VCR functions, graphics camera and slide projector.	
(2) JVC TK-1070 2/3" Single CCD Color Camera	
(1) Parker Visions Cameraman CMP - 2002E -includes base unit, wireless lapel mic. and handheld remote.	
(1) Elmo EV-368 Color Graphics Stand/Camera	
(1) Remote Diagnostics Modem	
Norstan Room System Subtotal	$24,220
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 2 - Supporting (56 to 384 Kbps) CTX and CCITT (QCIF and FCIF) Algorithms	6,000
(1) RS-449/V.35 Dual V.35 Network Interface w/RS-366	1,125
CLI-Video Codec Subtotal	$26,625
Miscellaneous	
(1) Ascend Multiband (MB-2DSX-2P)	$5,200
(1) Shipping	950
Miscellaneous Subtotal	$6,150
Norstan D-35 total	**$56,995**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500
-Equivalent component substitutions may be provided

CLI Gallery 225 Room System
(Dual 25" Monitor System running up to 1.544 Mkbps)
ND-225-AP3

Description	MHEC Price
CLI - Gallery Room System	
(1) Gallery 225/Rollabout	$26,250
(1) Front Camera with Pan/Tilt/Zoom/Focus	N/C
(1) 25" Motion Monitor	N/C
(1) 25" NTSC Motion Monitor	N/C
(1) Voice Crafter Audio System w/2 mics	N/C
(1) Remote Diagnastics Modem	N/C
(1) Elmo 308 Document Camera/Stand	N/C
(1) Auxiliary Camera with Pan/Tilt/Zoom/Focus	3,600
(1) Enhanced Video Distribution	3,000
CLI 225 Room System Subtotal	$32,850
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 3 - Supporting CTX, CTX Plus and CCITT (QCIF and FCIF)	9,000
(1) RS-449/V.35 Dual V.35 Network Interface w/RS-366	1,125
CLI - Video Codec Subtotal	$29,625
Miscellaneous	
(1) Ascend Multiband Plus (MB-1DSX-1CSU-2P)	$9,200
(1) Shipping	950
Miscellaneous Subtotal	$10,150
Norstan - CLI 225 Total	**$72,625**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500

CLI Gallery 235 Room System
(Dual 35" Monitor System running up to 1.544 Mkbps)
ND-235-AP3

Description	MHEC Price
CLI - Gallery Room System	
(1) Gallery 235/Rollabout	$31,125
(1) Front Camera with Pan/Tilt/Zoom/Focus	N/C
(1) 35" Motion Monitor	N/C
(1) 35" NTSC Motion Monitor	N/C
(1) Voice Crafter Audio System w/2 mics	N/C
(1) Remote Diagnastics Modem	N/C
(1) Elmo 308 Document Camera/Stand	N/C
(1) Auxiliary Camera with Pan/Tilt/Zoom/Focus	3,600
(1) Enhanced Video Distribution	3,000
CLI 235 Room System Subtotal	$37,725
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 3 - Supporting CTX, CTX Plus and CCITT (QCIF and FCIF)	9,000
(1) RS-449/V.35 Dual V.35 Network Interface w/RS-366	1,125
CLI - Video Codec Subtotal	$29,625
Miscellaneous	
(1) Ascend Multiband Plus (MB-1DSX-1CSU-2P)	$9,200
(1) Shipping	950
Miscellaneous Subtotal	$10,150
CLI 235 Total	**$77,500**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500

Norstan D-27 Room System
(Dual 27" Monitor System running up to 1.544 Mbps)
ND-D27-AP3

Description	MHEC Price
Norstan Room System	
(1) Rollabout System (Choice of cabinet style or wall mountable)	
(1) Gentner GT-700 Full Duplex Audio System with: echo cancellation, mic mixing, (2) mics, (1) JBL speaker and is rack mountable	
(2) Sony NTSC 27" Monitors (w/PIP)	
(1) AMX Accent control System (wireless remote) to control Monitor/Receiver Power, Audio System Volume, room lighting, VCR functions, graphics camera and slide projector.	
(2) JVC TK-1070 2/3" Single CCD Color Camera	
(1) Parker Visions Cameraman CMP - 2002E -includes base unit, wireless lapel mic. and handheld remote.	
(1) Elmo EV-368 Color Graphics Stand/Camera	
(1) Remote Diagnostics Modem	
Norstan Room System Subtotal	$22,420
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 3 - Supporting CTX and CCITT (QCIF and FCIF)	9,000
(1) RS-449/V.35 Dual V.35 Network Interface w/RS-366	1,125
CLI-Video Codec Subtotal	$29,625
Miscellaneous	
(1) Ascend Multiband Plus (MB-1DSX-1CSU-2P)	$9,200
(1) Shipping	950
Miscellaneous Subtotal	$10,150
Norstan D-27 total	**$62,195**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500
-Equipment Component Substitutions may be requested.

Norstan 2-35 Room System
(Dual 35" Monitor System running up to 1.544 mbps)
ND-D35-AP3

Description	MHEC Price
Norstan Room System	
(1) Rollabout System (Choice of cabinet style or wall mountable)	
(1) Gentner GT-700 Full Duplex Audio System with: echo cancellation, mic mixing, (2) mics, (1) JBL speaker and is rack mountable	
(2) Mitsubishi CS-35 MX1 35" Monitor/Receiver	
(1) AMX Accent control System (wireless remote) to control Monitor/Receiver Power, Audio System Volume, room lighting, VCR functions, graphics camera and slide projector.	
(2) JVC TK-1070 2/3" Single CCD Color Camera	
(1) Parker Visions Cameraman CMP - 2002E -includes base unit, wireless lapel mic. and handheld remote.	
(1) Elmo EV-368 Color Graphics Stand/Camera	
(1) Remote Diagnostics Modem	
Norstan Room System Subtotal	$24,220
CLI - Video Codec	
(1) Rembrandt II/VP Codec	$19,500
(1) Application Package 3 - Supporting CTX and CCITT (QCIF and FCIF)	9,000
(1) RS-449/V.35 Dual V.35 Network Interface w/RS-366	1,125
CLI-Video Codec Subtotal	$29,625
Miscellaneous	
(1) Ascend Multiband Plus (MB-IDSX-ICSU-2P)	$9,200
(1) Shipping	950
Miscellaneous Subtotal	$10,150
Norstan D-35 total	**$63,995**

-Includes One Year Depot Warranty
-Installation and Training available for $3,500
-Equipment Component Substitutions may be requested

Custom Room System

This is a complete interactive video system designed for a typical 20' x 30' classroom, and should include 2 cameras, a document camera, a CODEC unit, preview monitors, display monitors, and an advanced audio system. This system is designed for 16-32 people in a learning or classroom environment. Optional equipment might include three-chip cameras, additional display or preview monitors, and a proprietary algorithm for data compression; however, the Committee welcomes a list of any additional optional equipment that you deem appropriate.

A sample custom room system is included in this proposal. The different 20' x 30' room layouts have been diagramed. All three utilize the same equipment components and provide the same functionality. A CLI Codec with Application Package 3 for using CLI's CTX and CTX Plus or CCITT's QCIF and FCIF has been included. An Ascend Multiband Plus has also been included for T-1 network termination.

For twenty five years, Blumberg has served the communications needs of business, industry and education. Blumberg has been very active in the design and implementation of interactive room systems for education in Minnesota as well as throughout the US. The utilization of Blumberg's expertise and wide product offering virtually guarantees the flexibility and quality that MHEC will need to meet the diverse room requirements.

Blumberg Communications will be acting as a sub-contractor to Norstan and Norstan will manage the project. The following pages represent the room design as specified by MHEC. As you review this design, please keep in mind that there are a myriad of options. We designed this room with both high function and cost consciousness. We can substitute components in any area of the room design.

The following conditions are specific to the room system at each location.

- Electrical outlets, including electrical connection to the projection screen shall be provided by MHEC.
- The ceiling structure must be accessible and able to support the monitors and projector.
- All equipment is of commercial grade and most products come with a one year parts and labor warranty (TV, VCR, an Cameras). At the request of a customer, Norstan and Blumberg communications will make recommendations on extended warranties or maintenance contracts for specific components.
- Because of the three year duration of the contract, customers will be responsible for any price increase from the manufacturer. However, Norstan/Blumberg will keep discount levels intact.
- Three hours of training will be provided at each site. Additional training will be available at $45.00 per hour.
- Installation of room systems include all sites within a 100 mile radius of the Twin Cities. From 100-250 miles at $350.00 per site; sites over 250 miles from the Twin Cities add $500.00 per site.

CUSTOM ROOM SYSTEM

The following represents an example of the Norstan/Blumberg Custom Rooms. Three different rooms have been designed using identical Audio Video equipment. Actual design and hardware will vary due to individual members needs.

Room System Components	Quantity
Panasonic Model WV-D5100 Single CCD Color Video Camera	2
Panasonic Model WV-LZ14/8AF 8:1 Zoom Lens with Auto Focus	2
Pelco Model PT-280-24P/PP Pan/Tilt Head with Preset Pods	2
Pelco Model CX-9024 RXI-PP Control Receiver	2
Pelco Model CM-705-D Desktop Controller with 32 Preset (No Zoom/Focus Control)	2
Panasonic Model WV-5203B Triple 5" Black/ White Preview Monitor	1
Panasonic Model WJ-300 C Video Distribution Amplifier	2
Panasonic Model WJ-220R Video Switcher	2
Elmo Model EV-368 Single CCD Document Camera (includes side lights)	1
Sony Model SVO-1410 VHS Videocassette Recorder	1
JVC Model TM-2760SU 27" Industrial Color Video Monitor/Receiver	4
Peerless Model WMY-127-SU Suspended Ceiling Mount for 27" Monitor/Receiver	4
Panasonic Model PSH-9000 Wall Mount for Camera and Pan/Tilt Head	2
TOA Model AX-1000 Automatic Eight Channel Modular Mixer	2
TOA Model M-01F Microphone Module	10

Room System Components	Quantity	
TOA Model U-01R Auxiliary Input Module	1	
TOA Model 870-XXX True Diversity Wireless Microphone System	1	
Audio Technica Model AT-851a Low-Profile Microphone	9	
TOA Model F10 Surface Mount Speakers	2	
Gentner Model GT-700 Full Duplex Audio Conferencing System with 2-Channel Mixer, Power Amplifier and Echo Cancellation.	1	
Micro Audio Model 1.0B Graphic Equalizer	1	
Cables, Connectors and Miscellaneous Hardware	As req.	
AMX Access Wireless Remote 1 Control System (w/touch-panel)	1	
Far End Camera Control (Requires (1) RS-232 Port)	1	
Remote Diagnostics Modem	1	
ROOM SYSTEM COMPONENTS SUBTOTAL		$37,012.00
CLI - Video Codec		
Rembrandt II/VP Codec	1	$19,500.00
Application Package 3 Supports CTX, CTX Plus and CCITT (QCIF and FCIF Olgorithms)	1	$9,000.00
RS-449/V.35 Dual V.35 Network Interface w/RS-366	1	$1,125.00
CLI - VIDEO CODEC SUBTOTAL		$29,625.00

Miscellaneous

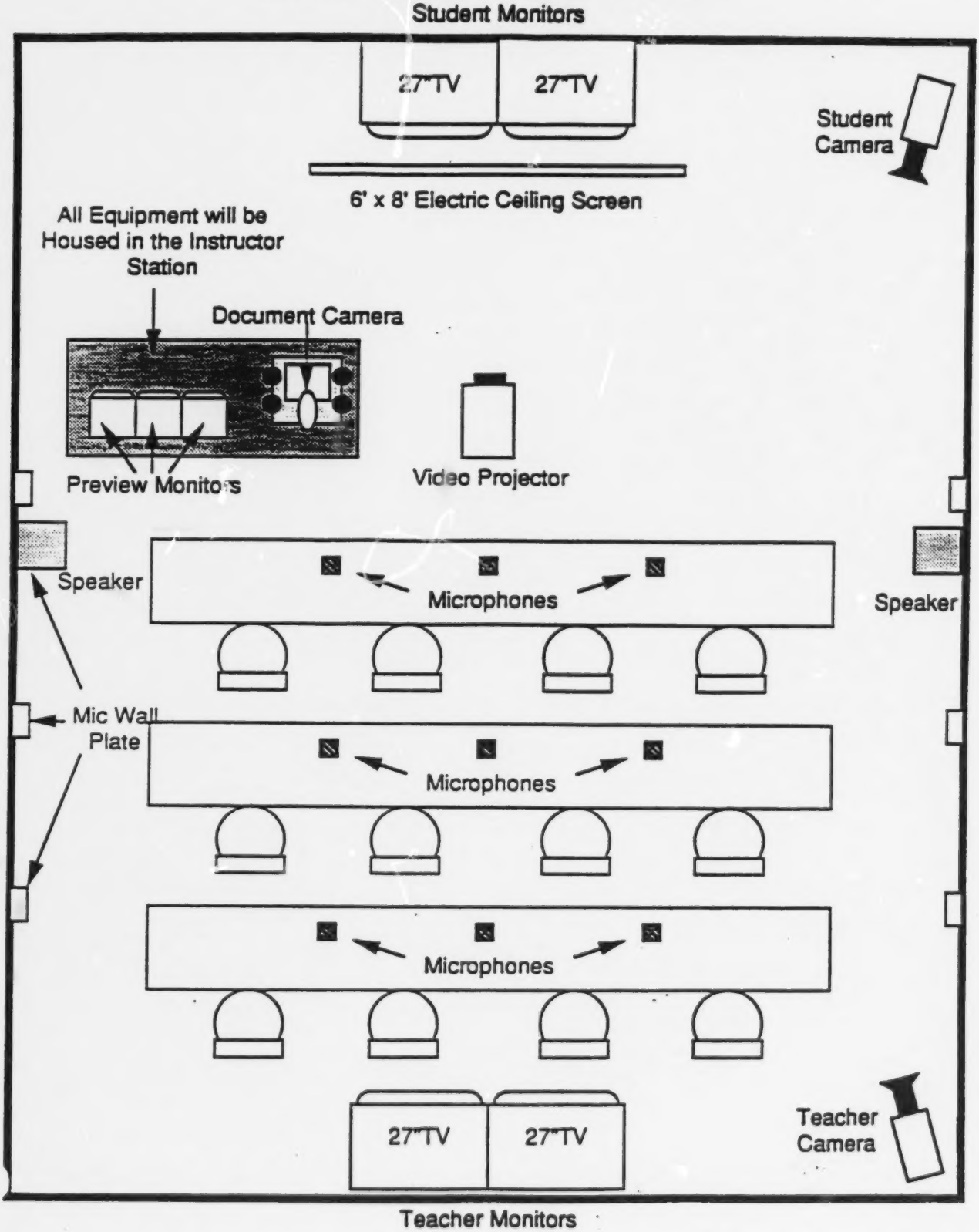
Ascend Multiband Pius (MB-1DSX-1CSU-2P)	1	$9,200.00	
Design and Engineering	As req.	$750.00	
On-Site Installation	1	$6,500.00	
Shipping	1	$1,250.00	
MISCELLANEOUS SUBTOTAL			$17,700.00
OPTION 3 - CUSTOM ROOM TOTAL			$84,337.00*

*NOTE: Actual labor costs will increase total

*Equivalent component substitutions may be provided.

CLASSROOM LAYOUT

(20' X 30' Classroom - Diagram Not to Scale)



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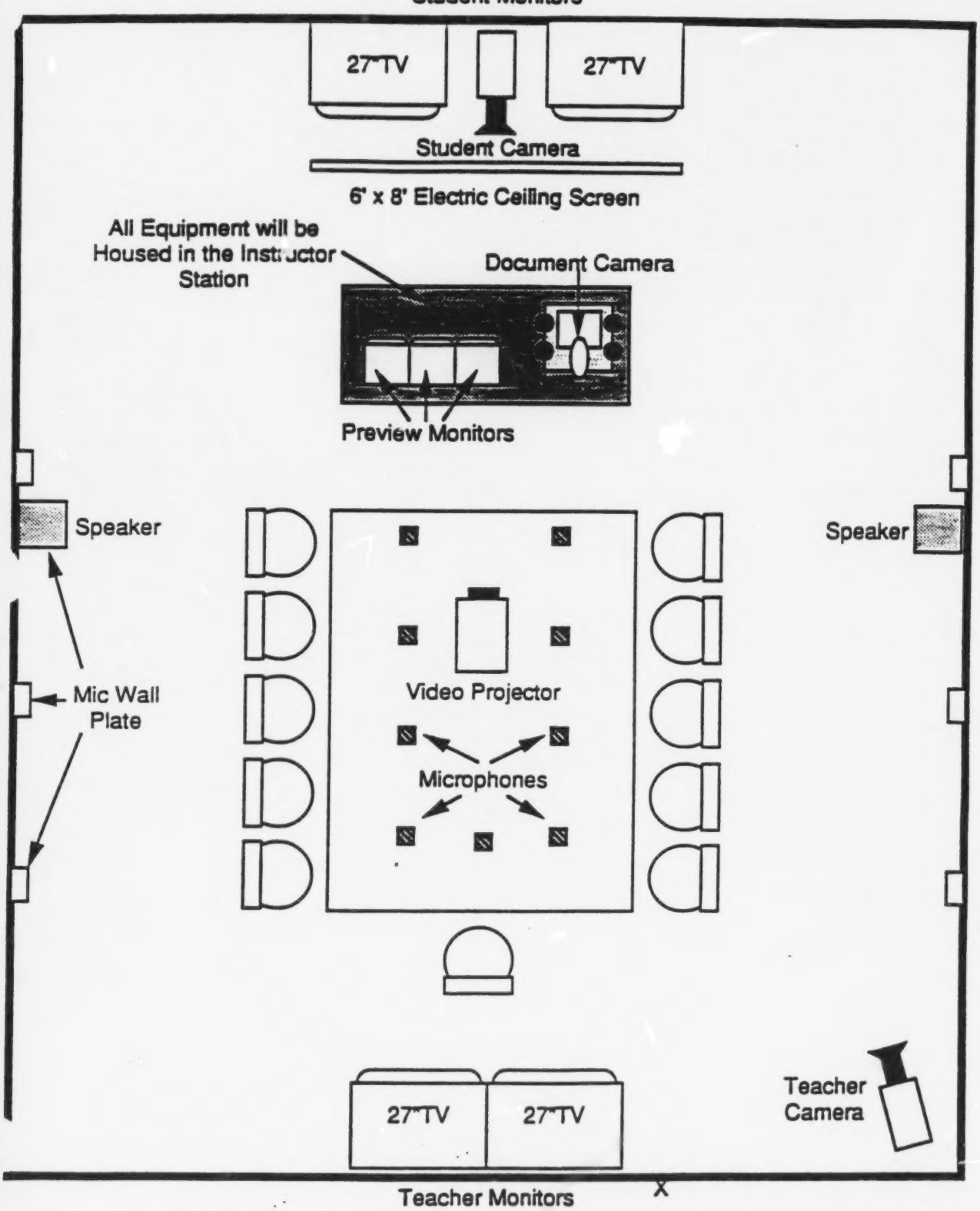
BOARDROOM LAYOUT

(20' X 30' Classroom - Diagram Not to Scale)



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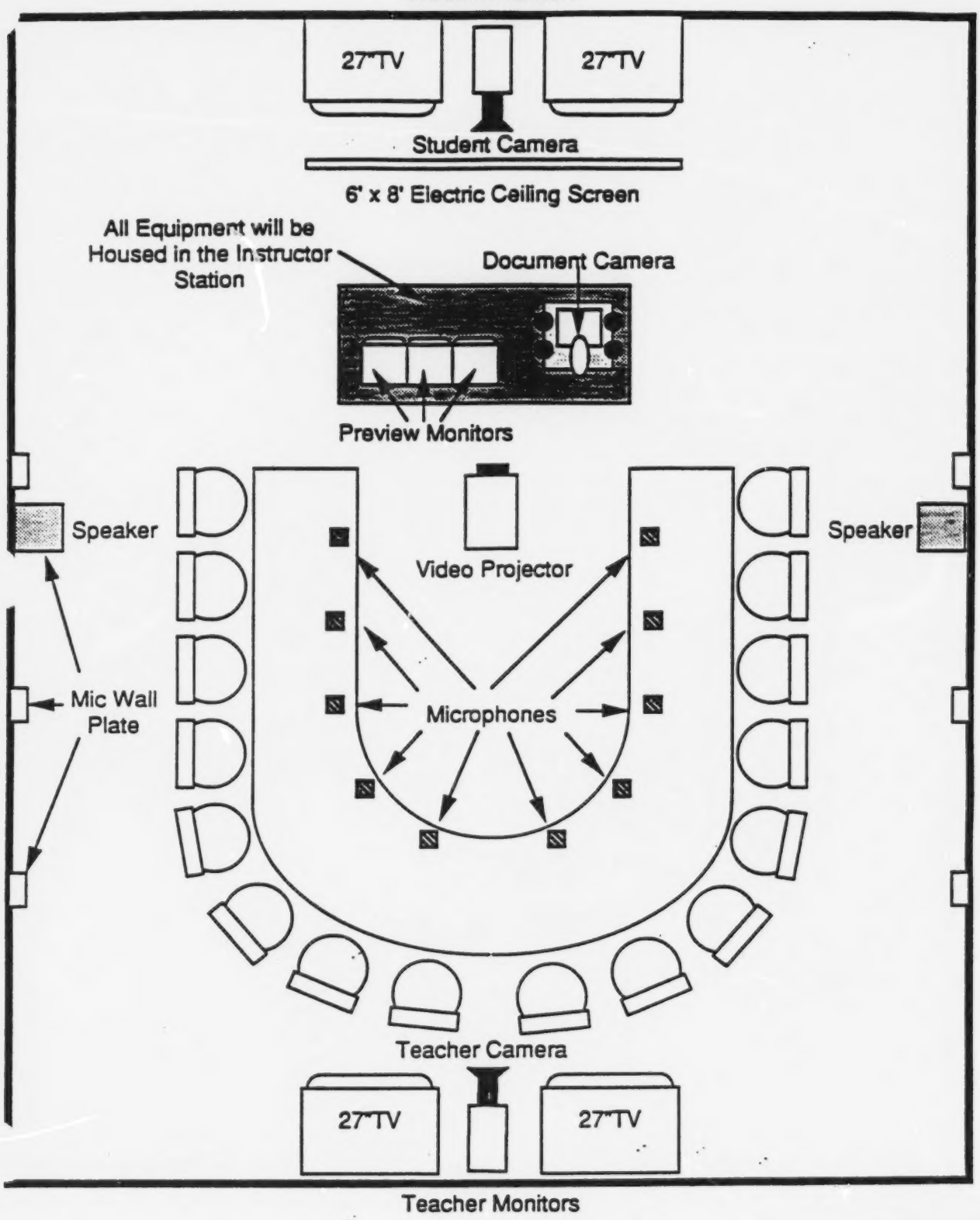
HORSESHOE LAYOUT

(20' X 30' Classroom - Diagram Not to Scale)



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COMPRESSION
LABS, INCORPORATED

2860 Junction Avenue
San Jose, CA 95134
Direct Dial (408) 922-5444
Corporate (408) 435-3000
FAX (408) 922-4666
Telex 171619

Ted S. Augustine
Vice President, Sales

July 1, 1993

Norstan, Inc.
Mr. Ervin Kamm
Chief Executive Officer and President
6900 Wedgwood Road
Maple Grove, MN 55311

Dear Erv,

I am reinforcing several pricing assurances from CLI to Norstan in specific support of your formal proposal for the very large partnering opportunity with MHEC.

As you know, CLI has a Medallion Program in place which determines discount on new videoconferencing systems and also includes CLI's aggressive pricing to your installed base for upgrades and trade-ins on earlier CLI technologies. Norstan is one of a very small number of CLI partners who have achieved the Platinum Medallion level, which represents the highest level of joint business commitments and discount level.

Over and above the Platinum Medallion level, we both know that the Norstan / CLI partnership will continue to be in "the best" category, in part because of the professional manner that you have integrated CLI videoconferencing systems into your product line and corporate culture. Your customers will continue to be the primary beneficiaries of the Norstan / CLI partnership.

I am very pleased that you have personally taken the opportunity to be part of the team working with MHEC. When I can be of further assistance please call me on 408-922-5444.

Sincerely,

Ted S. Augustine
Vice President - North American Sales

REPRESENTATIVE CLI VIDEOCONFERENCING USERS

Aerospace
Aerojet
Allied-Signal Aerospace
Bell Helicopter
Bendix/King
Division of Allied-Signal
Boeing
British Aerospace
Dowty Aerospace
Dyncorp Systems
ESL
Ford Aerospace
GE Aerospace
General Dynamics
Grumman
Hughes Aircraft
Hughes Electro-Optical &
Data Systems
Hughes Space & Communications
Hughes Simulations Systems
ITT Avionics
Lockheed Aeronautics
Martin Marietta
McDonnell Douglas
Pratt & Whitney
Rockwell International
Sikorsky Aircraft
TRW Aerospace
Westinghouse Defense

Automotive
BMW
Toyota Motor Sales USA

Banking & Finance
Alex. Brown & Sons
American Savings Bank
AmSouth Bank
BNL (Banca Nazionale Del Lavoro)
Banamex
Bank of America
California Federal Savings
Canada Trust
Capital Group
Kemper Financial
Royal Bank of Canada
Security Pacific Bank
Sovran Bank
TRW Credit Corp.
Visa International

Consulting
FocusVision Network
McKinsey & Company Inc.

Contruction/Engineering
Fluor Daniel
Norwegian Contractors A/S

Chemicals
Betz Labs
Manville
Union Carbide

Communications
AT&T
Advanced Business Communications
ADCOM
Alascom
Alberta Government Telephone
Ameritech Services, Inc.
Bell Canada
Bell Northern Research
Bell South
British Columbia Telephone
Cable & Wireless
Case Communications
City Signal
Comsat
Contel ASC
Dalsat
EB Nera A/S
Ericsson
ESA (European Space
Administration)
France Telecom
GTE
General Electric Americom
Harbor Bay Telecommunications
Hawaiian Telephone Company
Hong Kong Telephone
ITA (International
Telecommunications
Administration)
ITT
ITSA (Informatica Y Telecom S.A.)
KDD
Leegood Automatic
Lightnet
Manitoba Telephone
Mercury (U.K.)
Midwest Communications
Midwest Image Communications
Mitre Corporation
NTT
Norlight
Norstan Inc.
Northern Telecom
O.T.C. Australia
Ohio Bell
Opus Alcatel
Pacific Bell
Planning Research Corporation
SAIC
SaskTel
Selesta Networks
Singapore Telecom
Standard Railroad & Telephone
Standard Telephone & Radio
Swedish Space Corporation
Swedish Telecom
Telecom Australia
Telecom Canada
Telecom Mexico
Telesector, a division of NYNEX
Time Warner Inc.
US Sprint
US Sprint International
U.S. West
U.S. Satellite
United Telecom
Wisconsin Bell

Education
California State University
Columbia University
Duchess Community College
Florida A & M University
Florida State University
Gibson County School District
Miami Dade Community College
Micro Electronics Center of
North Carolina
North Dakota State University
Pennsylvania State University
Tehachapi High School
University of Health Sciences/
Chicago Medical School
University of Minnesota
University of Missouri
University of Texas
University of Wyoming
Vermont Technical College
Virginia State University
W. Virginia N. Community College

Electronics
Advanced Micro Devices
Allied-Signal, Inc.
Apple Computers
Applied Materials
Computer Associates International
Cray Research
Eastman Kodak Company
EG&G
Electronic Data Systems
General Electric
Harris Corporation
Hewlett Packard
IBM
IOMEGA Corp.

(continued on back)

Electronics (Continued)
Information Services International
Informix Software, Inc.
Mead Data Central
Mentor Graphics
Microsoft
Motorola
National Semiconductor
Nixdorf
Novell
Rank Xerox
SGS Thompson
Samsung Electronics
Sony
Tandem Computers
Texas Instruments
3M
Ungermann Bass
Unisys
United Technologies Corp.
Westinghouse
Xerox

Entertainment
BMG Music
Warner Records

Food
RJR Nabisco

Government
Alaskan Air Command
Australian Department of Defense
City of Baton Rouge
City of Houston
City of Los Angeles
Los Angeles County
State of Hawaii
State of North Dakota
US Air Force Communications Command
US Air Force Logistics Command
US Air Force Rome Air Defense Command
US Air Force Systems Command
US Air Force Tactical Command
US Army Forces Command
US Army Intelligence Command
US Army Material Command
US Army Training & Doctrine Command
US Central Command
US Defense Communications Agency
US Defense Intelligence Agency
US Defense Language Institute
US Defense Telephone Service-Washington
US Department of Defense
US Department of Energy
US Department of Justice
US Department of State
US Department of Transportation
US Environment Protection Agency
US Federal Emergency Management Agency
US General Accounting Office
US General Services Administration
US Headquarters, Department of the Army
US Health & Human Services
US National Aeronautic and Space Administration
US National Security Agency
US National Security Council
US National Telecommunications Information Agency
US Naval Air Systems Command
US Naval Commander in Chief—Atlantic Fleet
US Naval Commander in Chief—Pacific Fleet
US Naval Intelligence Command
US Naval Sea Systems Command
US Naval Supply Systems Command
US Naval Undersea Warfare Engineering Station
US Naval Underwater Systems Command
US Navy Space and Warfare
US Office of the Undersecretary of Defense, Acquisition
US Space Command
US Special Operations Command
US Strategic Air Command
US Strategic Defense Initiative Organization
US Transportation Command

Health Care
Cleveland Clinic
CRITIKON
Medical Heritage

Insurance
Allstate Insurance
American General
California Western Life
Empire, Blue Cross & Blue Shield
Guardian Royal Exchange
Liberty Mutual
Lincoln National Corporation
Maryland Casualty
New York Life
Standard Life Insurance

Judicial
Brooklyn N.Y. District Attorney's Office
Harris County Municipal Court
Manhattan District Attorney

Manufacturing
Black & Decker Corporation
Clorox
Eastman Chemical
GE Lighting
GE Motors
Johnson & Johnson
Kimberly-Clark
Leslie Fay Co. Inc.
Scott Paper
Textron
Vitro Corporation

Oil & Gas
Amoco
Coch Industries
Enron
Esso Resources
Phillips Petroleum
Southern California Gas

Pharmaceuticals
Burroughs-Wellcome
Eli Lilly Co.
Merck & Company
Schering-Plough
Searle
SmithKline Beecham
Sterling Drug
UpJohn

Public Utilities
Pacific Power & Light

Real Estate
The Fieldstone Company

Retail
Bullocks
Levi Strauss & Company
Lucky Stores
Macys
Sears, Roebuck & Company

Soft Drink Manufacturers
The Coca-Cola Company

Transportation
CSX
Federal Express
New York Port Authority
Sea-Land Corporation

CLI® COMPRESSION LABS, INCORPORATED
2860 Junction Ave.
San Jose, CA 95134
(408) 435-3000

Appendix 3

Sample Interactive Video Communications Costs Using MHEC Network for Transmission

BEST COPY AVAILABLE

The MHEC Telecommunications Network

Sample Interactive Video Communications Costs Using
MHEC Network for Interstate Transmission

Price savings for dial-up video have been established for intrastate and interstate calls on the MHEC Telecommunications Network. The network offers a Virtual Private Network as a backbone for video signals utilizing Sprint's fiber-optic network.

Rates for interstate 1/4-T1 video are approximately $20 per hour for on-network calling at peak hours. Dial-up speeds as low as 56kb and as high as full-T1 are available on the MHEC Telecommunications Network. Intrastate rates vary by state, please contact your state's MHEC contact for intrastate rate information.

The following is transmission pricing for a one hour on-net video conference on the MHEC Network between two institutions in two different states. A switched video conference (dial-up from one location to another) is priced as a voice call over the VPN:

Interstate (On-Net to On-Net)

112k (2 channels):	Day	$ 6.36
	Non-Day	$ 3.84
336k (6 channels):	Day	$19.08
	Non-Day	$11.52
672k (12 channels):	Day	$38.16
	Non-Day	$23.04
1.344k (24 channels):	Day	$76.32
	Non-Day	$46.08

Appendix 4

The MHEC Virtual Private Network

MHEC
Advancing Education Through Cooperation

Midwestern Higher Education Commission

The MHEC Telecommunications Network

What is the MHEC Network?

The MHEC Network offers a complete telecommunications solution for higher education institutions and state agencies in each MHEC member state. This program offering addresses each institutions' needs and goals by offering a tailored mix of products and services. By using a Virtual Private Network (VPN) as its backbone, the MHEC Network allows each member to transmit digitally compressed voice, data, and video signals through fiber-optic lines.

Whether the calls are intrastate, interstate, or international, MHEC's program offers flexible services and special prices to each participant.

How does it work?

As a result of a competitive bid process between major interexchange carriers (IXCs) in 1992, MHEC selected Sprint as its telecommunications administrator. Under this contract, the MHEC Network is managed by Sprint's team of account representatives, national managers, and service technicians.

To participating colleges and universities, the network's transmission services are easily accessible. Any long-distance call is forwarded from the institution to the MHEC Network, and then transmitted via fiber-optic lines to its destination. No additional access numbers are needed, and there are no codes to remember.

Who is eligible to participate?

All public and private non-profit colleges, universities, community colleges, and technical institutes with 501(c)3 status, and state government agencies in MHEC member states are welcome to participate in the program.

The Midwestern Higher Education Commission (MHEC) was established in 1991 by the Midwestern Regional Education Compact, an interstate agreement among Midwestern states. The current members of MHEC are Illinois, Kansas, Michigan, Minnesota, Missouri, Nebraska, and Ohio. The mission of MHEC is to improve higher education opportunities and services in the Midwest region through interstate cooperation and resource sharing. MHEC programs include activities to produce regional cost savings to benefit all colleges and universities, expand student access, support public policy development through analysis and information exchange, facilitate regional cooperative academic programming, encourage quality management, and promote economic growth through higher education and industry innovation.

What are the basic features of the MHEC Network?

The MHEC Network provides institutions with full telecommunications connectivity within the state, the nation, and throughout the world. Special rates have been established for on-net, on-to-off net, and off-net calls, offering substantial savings over standard rates.

By contracting with Sprint, MHEC is able to provide a 100 percent fiber-optic backbone with digital transmission for all the telecommunication needs of its members. On-net connections to other institutions, gateways for off-net calls, and access to over 200 countries worldwide are all included in MHEC's basic service agreement with Sprint.

What are the value added services?

The MHEC Network offers institutions many additional services, including: • 800 services • direct termination services • international services • videoconferencing • student resale • operator services • Sprint Conference Line • SprintFax • ClearLine Private Line Services • SprintNet Services • Group IV FAX transmission capability • FONCARD • Clarity (WATS) Services • PublicFON.

Who else is connected?

Currently, institutions in Ohio, Illinois, Michigan, and Missouri are connected to the MHEC network, and discussions are beginning in several other Midwestern states. In addition to interconnecting all MHEC participants on the same network for low-cost on-net calls, MHEC's Network also provides on-net access to the national SIGN network, a group of over 250 universities and government agencies already using Sprint.

Sprint's National Fiber-Optic Network

MHEC
Advancing Education Through Cooperation

What makes this program unique?

Just like any other telecommunications contract, MHEC's agreement with Sprint covers all basic long-distance telecommunications services. Basic rates (intrastate, interstate, and international), time periods (peak and non-peak), and structures (on-on, on-off, off-on, and off-off) are all included. But the real value lies with three unique MHEC Network arrangements:

Special Rates

The price savings that have been established for intrastate and interstate calls are not distance sensitive. One low rate applies for any call within a state's borders, perhaps from one branch campus to another. Another low rate applies for every call within the Midwest and across the country, allowing institutions to take advantage of the same flat rate. In addition to domestic price advantages, institutions also realize substantial savings for international calls.

Volume Discounts

As a participant in the MHEC program, each institution also benefits from the traffic volume of all MHEC Network members. Therefore, the greater the enrollment, the greater the cost savings for each participant.

Real Savings

Because the MHEC Network's goal is to provide Midwestern higher education with cost effective communications to the nation and the world, all cost savings realized from this program are passed on to the participating institutions and state agencies.

The MHEC Network: A World of Possibilities

MHEC
Advancing Education Through Cooperation

I'm already using Sprint. Can I participate in the MHEC program?

Absolutely. MHEC's contract with Sprint allows eligible Sprint customers to enroll in the MHEC program at the next opportunity as defined by your contract. Contact MHEC or your Sprint representative for additional information.

What's in store for the future?

Because MHEC is committed to implementing the most innovative technologies, Sprint was a natural choice for the MHEC Network. By deploying Signaling System 7, Sprint laid the foundation for new, advanced technologies such as ISDN, switched digital services, intelligent networking, and LEC SS-7. MHEC's Network will continue to benefit as Sprint lays new fiber-optic cables across the United States and the world, and as Sprint continues its research and development of new technologies.

MHEC continues to move forward on other fronts as well. To meet the interactive video needs of colleges and universities in MHEC member states, MHEC is preparing a regional equipment price list. Special pricing will be secured by MHEC for cameras, monitors, sound systems, room designs, multipoint control units (MCUs), and CODECs. In short, discount prices for all components of distance learning and teleconferencing systems will be negotiated and provided to MHEC members. All of this equipment will be fully compatible with the MHEC Network, allowing full-motion video, sound, and two-way interactive signals to be transmitted across the Midwest and beyond.

Who should I contact for additional information?

If you have additional questions about the MHEC Network, or wish to talk further about how the network might work with your state or institution, feel free to contact MHEC directly.

The Midwestern Higher Education Commission
1300 South Second Street; Suite 130
Minneapolis, MN 55454

Office: 612/626-8288
FAX: 612/626-8290

MHEC
Advancing Education Through Cooperation

Appendix 5

The MHEC Interactive Video Request For Information (RFI)

MHEC

ADVANCING EDUCATION THROUGH COOPERATION

INTERACTIVE VIDEO PROJECT

REQUEST FOR INFORMATION

PREPARED BY THE
MIDWESTERN HIGHER EDUCATION COMMISSION
TELECOMMUNICATIONS COMMITTEE

March 1993

The Midwestern Higher Education Commission is a nonprofit regional organization established by compact agreement to assist midwestern states in advancing higher education through interstate cooperation and resource sharing. Member states are:

Illinois	Missouri
Kansas	Nebraska
Michigan	Ohio
Minnesota	

MHEC seeks to fulfill its interstate mission through programs which:

- produce administrative cost savings benefits for post secondary education
- encourage student access and affordability
- support public policy analysis and information exchange
- facilitate regional academic cooperation
- promote industry/higher education innovation

Printed March, 1993
Midwestern Higher Education Commission
1300 South Second Street, Suite 130
Minneapolis, Minnesota 55454

MIDWESTERN HIGHER EDUCATION COMMISSION

I. TELECOMMUNICATIONS COMMITTEE

The MHEC Telecommunications Committee was established in 1992 for the purpose of developing interstate telecommunications initiatives on behalf of the Midwestern Higher Education Commission. The Committee seeks to expand the scope and quality of telecommunications services available to post secondary education institutions and systems throughout the midwest. It strives to achieve reduced costs and improved services that will benefit both small and large colleges and universities. The Committee receives its counsel from an assembly of state network committees in participating states.

The first major program initiative undertaken by the MHEC Telecommunications Committee was the creation of a Virtual Private Network (VPN) for the regional transmission of voice, data and video. The VPN was established through an agreement with Sprint Corporation and is officially known as the MHEC/Sprint Telecommunications Network. The Network incorporates seventeen different service offerings available to midwestern higher education. It also makes possible the use of existing public networks for the transmission of low-cost, switched, digitally compressed two-way interactive video.

The MHEC/Sprint Network consists of digital T-1 carriers from each member institution and state agency to Sprint Corporation's point-of-presence. Sprint provides a service management system that maintains a separate database for individual institutions and agencies and allows each to specify its own network definition. The point-of-presence has an all-digital high capacity switch, common channel inter-office signaling, and network announcement capabilities.

Participation in the MHEC/Sprint Network is voluntary, and is available to all public and private non-profit colleges, universities, community colleges and technical institutions and systems with 501(c)3 status, and to state government agencies in MHEC member states.

II. INTERACTIVE VIDEO TECHNOLOGY: Request for Information

A. *Purpose*

The purpose of this RFI is to gather essential information required to implement the MHEC/Sprint dial-up, high speed, two-way interactive video network. MHEC believes that distance learning technology and video conferencing offer unique opportunities to share high quality academic programs and services in a very cost efficient manner.

Many higher education institutions in MHEC states are either considering or have already begun instituting interactive video projects. These institutions are interested in common regional connectivity as well.

The following information is based on an earlier milestone effort undertaken by the Michigan Collegiate Telecommunications Association (MiCTA). MHEC acknowledges with gratitude the contributions of that organization to the planning of this project.

B. *General Guidelines*

The objective of the MHEC Interactive Video project is to make available regionwide, low cost, two-way interactive video network services to institutions and state agencies in MHEC member states. The MHEC Network requires high quality video technology and the most advanced service offerings possible to meet the educational communication needs of the midwestern higher education enterprise. It must provide the lowest pricing possible, and make that pricing available to all member institutions and state agencies.

Vendors intending to respond to this Request For Information should fill out the Intent to Respond Form located in Attachment A and FAX or mail it to the MHEC office. The vendor may respond to any or all of the requested sections, i.e. Network Capabilities, Network Equipment, and Classroom/Conference Room Designs.

Responses to this Request For Information are due April 23, 1993. Please submit your responses to:

Midwestern Higher Education Commission
ATTN: Ken Johnson, Chair
Telecommunications Committee
1300 South Second Street, Suite 130
Minneapolis, MN 55454

C. *Purchase and Lease Options*

Responses to the Network Equipment and Classroom/Conference Room Designs sections should include purchase and equipment lease options. Because of its diverse membership, MHEC seeks multiple equipment options to support its regional two-way interactive video network strategies.

D. *Alternatives to Request*

Vendors who do not comply to any request within this Request For Information (RFI) may propose an alternative to a specific section. Summaries of all alternatives should be included as attachments to the response.

E. *Purchase Statement*

As previously stated, one of MHEC's goals is to influence the development of telecommunications services to participating institutions and systems at reduced costs and improved quality. MHEC does not act as a central purchasing agent, but will endorse an agreement with a vendor. **Each individual member institution and system will enter into a purchase/lease agreement with the vendor(s) in accordance with their respective purchasing policies.**

F. *Analysis of Information*

Responses to this RFI will be analyzed by the MHEC Telecommunications Committee. The analysis will be based on the vendors' adherence to the RFI. Alternative responses will be closely examined. The findings and recommendations of the MHEC Telecommunications Committee will be submitted to the Commission for approval. Members of the Committee are:

Kenneth Johnson, Chair
Central Michigan University; 517-774-3089

Gregory Ashe
Ohio State University; 614-292-8845

Coleman Burton
University of Missouri, Columbia; 314-882-4478

Steven Cawley
University of Minnesota, Twin Cities; 612-625-8855

Kia Malott
Southern Illinois University; 618-453-2404

David Murphy
Midwestern Higher Education Commission; 612-626-8288

Ruth Michalecki
University of Nebraska; 402-472-2000

Barbara Paschke
Kansas Board of Regents; 913-296-3422

G. *Endorsement of Vendor(s).*

The Telecommunications Committee will recommend specific endorsements to the Commission. Upon approval, MHEC will assist in the promotion of the selected vendor(s) to its membership.

III. NETWORK DESIGNS AND CAPABILITIES

A. *Network Configuration*

The MHEC/Sprint network is designed on a switched (dial-up) digital T-1 (1.544 Mbps) backbone via public or private networks. The network has the capability of processing voice, data, and video on the same T-1 access and has two-way multipurpose functionality.

MHEC requests purchase and lease prices for CSU units to interface with the MHEC/Sprint network, if needed. Include product descriptions and specifications.

B. *Network Bridging*

MHEC requests that the vendor(s) submit a per-minute rate for establishing multi-point dial-up video conferencing through the network. If the bridging equipment is owned by the network, the vendor is requested to submit a per-minute rate and set-up cost for utilizing said services. Alternative bridging solutions are encouraged.

MHEC requests that vendor proposals include a description of how an on-net and off-net video conference call would be placed through the network from 112 Kbps to full T-1, what network facilities would be used (including CODEC conversions compatibility on an off-net call, and what equipment would be needed from a customer standpoint). Include any documentation.

IV. NETWORK EQUIPMENT

A. *CCITT H.261 CODEC*

MHEC endorses the CCITT international standard for CODECs of H.261, and requests that the vendor(s) submit purchase and lease prices for a CCITT H.261 CODEC. The vendor(s) should include installation and maintenance costs. Any response must adhere to the CCITT H.261 standard, 30 frames per second transmission rate, and other CCITT standards as found in Attachment B. The vendor(s) is requested to supply a compatibility chart of CODECs that have passed audio and visual communication interoperability tests with the vendors H.261 CODECs. A similar chart is requested for non-proprietary H.261 Multipoint Control Units.

The vendor(s) is requested to submit software and hardware upgrade costs and the frequency with which upgrades occur. MHEC requests that the vendor(s) supply optional pricing for the following add-on components: 1) Split Screen Unit; 2) Encryption; 3) NTSC Graphics; 4) Data Port Multiplexer; 5) V.35 single or dual interfaces, and 6) any other add-on components. Alternative responses should include pricing for equivalent components, as well as a product description and specifications.

B. *Bandwidth on Demand*

MHEC requests that vendors submit purchase, lease, installation, and maintenance costs as well as product descriptions and specifications for Customer Provided Equipment (CPE) that meet the seven requirements listed below (Vendors are also requested to explain the interaction between the CODEC, the network, and connectivity.):

1. Dynamically allocates bandwidth 'on demand' in 56 Kbps/64 Kbps channels. The equipment must have the capacity to allocate 2 to 24 channels.

2. Bandwidth that can be distributed by automatic, time-of-day, or manual allocation, and includes priority assignment. Include speed-call capabilities.

3. Customer Provided Equipment (CPE) that allows for multiple T-1 access. Specify maximum number of T-1 connections per CPE unit.

4. Backward compatibility with existing CSU/DSU products.

5. User interfaces for configuration, session monitoring, and diagnostics.

6. An RS-232 configuration interface, a V.35/RS-449 data interface and RS-366 or V.25 control dial interface. The interface for the video conferencing application shall be a menu-driven dialing mechanism.

7. A redial mechanism for loss of channel connectivity during transmission from 1-24 channels.

C. *Multipoint Control Unit (Bridging Equipment)*

MHEC requests that the vendor(s) submit purchase, lease, installation and maintenance costs for the Multipoint Control Unit. Responses must adhere to the CCITT H.261 standard, and other CCITT standards found in Attachment B. Responses must provide documentation and specifications along with a record of proven field tests and/or installations.

MHEC requests that the vendor(s) specify the maximum number of ports per bridge and the possible configurations per bridge. Additionally the vendor(s) is requested to specify how bridges are 'daisy-chained' or 'cascaded' together, how many ports are expendable for that application, and the maximum number of bridges that can be cascaded.

MHEC requests that the vendor(s) explain clocking techniques.

MHEC requests that the vendor(s) explain how control signaling is used through the bridge for voice, video, and chairman control.

MHEC requests that the vendor(s) include optional pricing for 1) Encryption; 2) Message Channel Control; and 3) Other channel interfaces.

V. CLASSROOM/CONFERENCE ROOM DESIGNS

In an ideal setting, MHEC would like participating institutions' Instructional Video Room/Video Conferencing Facilities to be of **homogeneous basic components**. As stated on page 1, MHEC participants will make use of compressed video in both an instructional two-way multi-point video setting as well as an administrative/ancillary service (such services would include inter-institutional consultations, regional collegiate meetings, academic counseling, recruiting, depositions, remote instructor updates, professional development activities, off-campus business, and industrial and medical training to name a few). It is of utmost importance to MHEC that the design of the Instructional Video Room/Video Conferencing Facilities (ITV) be flexible and unique.

Because of its diverse membership and budgetary/purchasing mechanisms at each institution, MHEC requests that the vendor(s) submit all available options for a) conference room designs, and b) audio, video, and systems integration components, along with any additional components that may be desirable.

A. *Audio System*

MHEC requests that the vendor(s) submit purchase and lease components price lists to meet a range of audio systems (including acoustical design and components), along

with optional components lists suitable for video instruction and video conferencing. Additionally, the vendor is requested to include installation and maintenance costs per system. The vendor will describe the speech-activated control, and/or chairman or instructor control mechanisms with regard to the student position, the instructor position, and if applicable, the systems integration component. The vendor should include all applicable product descriptions and specifications.

B. *Cameras/Video*

MHEC requests that the vendor(s) submit purchase and lease components price lists to meet a range of room designs, along with additional optional components lists that may be desirable for enhancing video conferencing and video instruction functions. Additionally, the vendor is requested to describe the camera functionalities, the speech-activation mechanism and/or chariman control mechanism for the audio system, the monitors, the VCR device, and if applicable, the control mechanisms for the systems integration equipment. The vendor should include all applicable product descriptions and specifications.

C. *Systems Integration*

MHEC requests that the vendor(s) submit purchase and lease components price lists to meet a range of room designs along with additional optional components lists that may be desirable for enhancing video conferencing and video instruction functions. The vendor is also requested to include installation and maintenance costs per system. The vendor should state all product descriptions and specifications, and indicate the functionality of the system parts and integration with regard to:

1. The audio system - specify the voice-activation, and/or chariman control functions, types of interfaces, and related general control functions.

2. The camera/video system - specify completely the video switcher(s) interface to the camera system, the maximum number of camera pre-sets, the camera control mechanism at the local and remote sites, and any other ancillary or peripheral attachments.

3. The VCR interface and Time Base Corrector (TBC).

4. The data port interface - specify the maximum number and types of data interfaces, data multiplexing, and two-way (multiple) data accessibility. Specify how the data screen is viewed through the CODEC.

5. The telephone and document facsimile interfaces.

6. The alpha-numeric character generator (if deemed necessary).

7. Graphics capabilities.

8. Other optional components, which may include CATV, microwave, fiber, and analog interfaces.

9. The instructor interface - describe, in detail, how the instructor will use the preceding equipment. Include any training materials, or courses (and costs), which may be required.

VI. SUMMARY

Vendors are encouraged to respond to all sections. Additional comments and/or equipment options may be included as needed. MHEC does not wish to preclude information relative to this RFI.

Vendors are also requested to indicate the competitive advantages and expertise that they have in addressing the RFI. MHEC requests that the vendor(s) submit at least five (5) references together with lists of installations completed within the last twelve (12) months. Please include all university and state installations accomplished during that time period.

MHEC requests that the vendor(s) include information on expected delivery dates, installation dates, or schedules, and if applicable, production schedules. In addition, any training, support, and warranty information being supplied by the vendor(s) should be attached. The vendor is requested to provide a maintenance plan that includes repair and spare parts kits, and response times for systems repairs or outages. The vendor is requested to provide a corporate overview, financial statements, and lists of personnel to be involved in the MHEC project.

MHEC would like to begin the implementation of a regional Two-Way Interactive Video Network during the 1993 calendar year.

VII. ATTACHMENTS

A. INTENT TO RESPOND FORM

B. CCITT CODEC STANDARDS

ATTACHMENT A. INTENT TO RESPOND FORM

_____, WILL RESPOND TO THE
(VENDOR NAME)

FOLLOWING SECTIONS AS CONTAINED IN THE MHEC RFI FOR A REGIONAL TWO-WAY INTERACTIVE VIDEO NETWORK:

CHECK ALL THAT APPLY:

NETWORK CAPABILITIES

1. CSU Pricing and T-1 Access Conditions _____
2. Network Bridging _____

NETWORK EQUIPMENT:

3. CCITT H.261 CODEC _____
4. Bandwidth on Demand _____
5. Multipoint Control Unit _____

CLASSROOM/CONFERENCE ROOM DESIGNS:

6. Audio System _____
7. Camera/Video System _____
8. System Integration _____

_____ _____
(Signature) (Date)

FAX to: 612-626-8290

ATTACHMENT B. CCITT CODEC STANDARDS

1. **OVERALL.** H.320

2. **VIDEO CODING.** H.261, both CIF and QCIF at 30Hz. Full CIF resolution 288 lines x 352 pixels; QCIF 144 lines x 176 pixels.

3. **FRAMING AND SIGNALING STRUCTURE.** H.221

4. **SIGNALING.** H.242

5. **SIGNALING.** H.230

6. **AUDIO CODING.** H.722, 7kHz ADPCM. Frequency response 50-7kHz. Failback to A-law or U-law if appropriate and G.728, 3.5 KHz. Frequency response 20-3.6 KHz, (user selectable).

7. **VIDEO INPUT/OUTPUT.** NTSC 525 line 60Hz.

8. **TRANSMISSION SIGNAL.**
   H11 (T-1). 15 way sub miniature D-type interface.

   Clock rate @ 1.544 MHz.

   Channel Coding. AMI/B8ZS per G.703, G.704 and G.733. RS449 and RS422 interfaces.

   Data rates. Selectable between 56/64 kbpsand primary port clock rate in 56/64 kbps increments.

MULTIPOINT CONTROL UNIT (ADOPTS ABOVE STANDARDS).

1. **AUDIO MIXING.** AV231.

2. **CONFERENCE CONTROL.** H.221 (BAS codes), chairman control (on issue of recommendation by CCITT).

LIST OF VENDORS CONTACTED

HJB Distributors
3140 Christy Way
Saginaw, MI 48603

NEC America, Incorporated
1750 East Golf Road, Floor 6
Schaumburg, IL 60173

Innovative Communications
1605 Kingston Drive
Saginaw, MI 48603

PictureTel
39111 West 6 Mile Road
Livonia, MI 48152

MCI Telecommunications Corporation
695 Kenmoor SE
Grand Rapids, MI 49506

LiTel Telecommunications Corporation
30200 Telegraphy Road, Suite 442
Birmingham, MI 48010

Anixter
4711 Golf Road
Skokie, IL 60076

Videoconferencing Systems, Inc.
5801 Goshen Springs Road
Norcross, GA 30071

Todd Communications
6545 Cecilia Circle
Minneapolis, MN 55439

Telecorp, Incorporated
32255 Northwestern Highway
Farmington Hills, MI 48334

Allied Telecommunications, Inc.
1301 South 8th Street
Richmond, IN 47374

Video TeleComm
2665 Oak Street
Highland Park, IL 60035

TeleDial America
250 Monroe NW, Suite 454
Grand Rapids, MI 49503

Peirce-Phelps, Incorporated
2000 North 59th Street
Philadelphia, PA 19131-3099

Communications Specialist
217 E. Sheridan
Petoskey, MI 49770

AT&T Network Systems
1600 Osgood Street, Room 2X102
N. Andover, MA 01845

Capitol Communications
1133 Seymore Avenue
Lansing, MI 48906

AmeriNet of Michigan, Inc.
122 N. Fourth Avenue
Ann Arbor, MI 48104

Northern Telecom, Incorporated
755 W. Big Beaver Road, Suite 601
Troy, MI 48084

Matsch Systems
900 Ionia NW
Grand Rapids, MI 49301

BT North America, Inc.
33533 West 12 Mile Road, Suite 100
Farmington Hills, MI 48331

Call Center Technologies
PO. Box 80
Gregory, MI 48137

GTE Telecom Marketing Corporation
455 East Ellis Road
Muskegon, MI 49443

Palaver Systems
4650 Lakehurst Court
Dublin, OH 43017

FD Hayes Electric Company, Inc.
2301 Beal Avenue
Lansing, MI 48901

Michigan Bell Telephone Company
29777 Telegraph Road
Southfield, MI 48034

Compression Labs, Incorporated
26911 Northwestern Highway, Suite 300
Southfield, MI 48034

Supply Technology, Inc.
15100 Northline Road, Suite 135
Southgate, MI 48195

GPT Video Systems
2975 Northwoods Parkway
Norcross, GA 30071-1575

Centigram Communications Corporation
18681 Alexander Road
Walton Hills, OH 44146

Media Technology, Inc.
2303 Weldon Parkway
St. Louis, MO 63146

Videotelecom
1901 West Braker Lane
Austin, TX 78758

Allied Telecommunications PO. Box
1016
1301 South 8th Street
Richmond, IN 47375

Allnet
30300 Telegraph Road, Suite 350
Bingham Farms, MI 48025-4510

Illinois Bell Communications
1011 South Second Street, Suite B
Springfield, IL 62704

Sprint Video Group
2987 Clairmont Road
Atlanta, GA 30329

Norstan
6900 Wedgwood Road
Maple Grove, MN 55311

RESPONDENTS TO RFI

Anixter
BT North America, Inc.
Compression Labs, Inc.
GPT Video Systems
Innovative Communciations, Inc.
Media Technology Inc.
NEC America, Inc.
Norstan Communications, Inc.
Peirce-Phelps, Inc.
PictureTel
Sprint/CLI
Todd Communications
Video Conferencing Systems Inc.

Appendix 6

MIDWESTERN HIGHER EDUCATION COMMISSION

COMMISSIONERS

and

COMMITTEES

MIDWESTERN HIGHER EDUCATION COMMISSION

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Charles Taylor, Treasurer	Ohio	Ken Jacob	Missouri
David Murphy, President		Connie Morrison	Minnesota
		Jerome Warner	Nebraska

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Charles Taylor, Treasurer
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*denotes interim member